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For What Features of Mechanical Practice May a Country Claim Credit?

The London "Engineer" in its issue of March 8, contains an editorial on the future of the British machine-tool trade, which was inspired by a visit to some leading machine tool makers. In the course of this article we find the following:

"Very little inquiry into the nature of the reformation contemplated was sufficient to show that the principles at its foot were specialization and the adoption of higher methods of manufacture. In several instances we were informed that all except a limited number of designs were being thrown out, and that by adopting rigs and jigs for the patterns retained, it was hoped to make increased profits or, if need be, to reduce prices. . . . The use of rigs and jigs is not new in this country. That they have not been more largely used is due to the peculiar conditions of British trade, and not to lack of knowledge of their existence or want of appreciation of their advantages. In America there appears to be an impression that they are of American origin. We would recommend those who think that they, among such features as inverted V's, change gears and other devices good and ill, were created on the other side of the Atlantic to study history."

We do not suppose it would be possible to learn at this date when or where "rigs and jigs" were first used, and we are quite sure the inquiry would be profitless, even though it succeeded in locating the first piece of scrap iron with two holes through it which was used to guide a drill in making correspondingly spaced holes, and which was thus a jig.

The "Engineer" in this article betrays a mistaken conception, which is often shown in other quarters, of the essential point wherefrom to judge of the characteristic features of a country. "One swallow does not make a summer," and one jig, even the first one, does not constitute mechanical practice nor determine what country is responsible and deserves credit for the system of manufacture of which the germ lay in the aforesaid piece of scrap iron. The situation finds a close parallel in the boring mill. As is well known, this tool originated in England. Its merits were not appreciated there, however, and it remained for this country to adopt it and make it a standard tool. A few boring mills have been made and sold in England, but they are there looked upon as an exceptional tool; of doubtful value, whereas here no well-informed mechanic would think of using anything else for certain classes of work. There they are to be found in a few shops; here in all having work suited to them. The boring mill is thus an established and recognized feature of American shops, forms an integral feature of American shop practice, and in its development is an American tool. This is often disputed because of the machine having originated in England, but to us it seems to be a left-handed sort of credit claim which can be set up for having invented a good thing and then failed to appreciate its merits.

It is precisely so with what the "Engineer" calls "rigs and jigs," by which it obviously means, though it, as obviously, does not comprehend, the organized reproduction of the same thing by manufacturing methods. Machine construction, as a branch of industry, developed earlier in England than here, and it was inevitable that some methods involving the manufacturing spirit should appear there first. Manufacturing methods differ from others in degree rather than in kind. It is impossible for anyone of an intellectual caliber above that of a Hottentot to reproduce the same article in quantity without departing from the methods by which he made the first one in order to save labor. The question as to the characteristic methods of different countries is not one of history at all. It is not of the past, but of the present. The whole subject being one of degree, the question as related to a comparison of different countries is also one of degree. In what country are these methods followed by the greatest number, in what country have they received their highest development, and in what country have they been applied to the greatest variety of industry? If any historical question be involved at all, it is properly: What country first led in the general adoption and development of these methods? and not: In what country was the first simple jig made?

Annual Trip of Students of Purdue University.

We have received a copy of the program of the annual trip of the students of Purdue University. The party consists of about eighty students with Dean Goss and Professors Goldsborough, Pence, Miller and Mr. Tence. The time occupied is from March 25 to 29 inclusive, and is mostly spent in visiting the industrial establishments of Chicago. While it is bound to be an enjoyable affair, it is strictly a business trip and cannot fail to be profitable to all concerned. A banquet tendered by the resident alumni of Chicago was enjoyed Tuesday evening.

Free Industrial Scholarship in New York.

The Manufacturers' Association, of New York, has appropriated $2,000 for a four years' industrial scholarship, open to young men of Greater New York. Those who desire to enter the competitive examinations should file applications not later than April 20, with James T. Hoile, secretary of the association, 198 Montague street, Brooklyn. Applicants must be at least 17 years old, have received at least three years' high-school instruction or its equivalent and must be unable to pay their own way through college. The successful candidate may select the school or college he desires to attend from the list approved by the commission.

Lathe & Morse.

In reply to an inquiry from a reader, whose address we have mislaid, the Draper Machine Tool Company, of Worcester, Mass., inform us that Lathe & Morse, of Worcester, ceased to do business in 1871.

They were succeeded by the Lathe & Morse Tool Company, which concern operated under that name until about May 19, 1892, when it was succeeded by the present Draper Machine Tool Company.

Germany's Foreign Trade in Machinery for 1900.

The export statistics of the German Empire for the year 1900 show as follows:

Machinery, instruments and railroad material were imported to the quantity of 145,674 tons, valued at 92,406,000 marks,* as compared with 150,439 tons at 81,495,000 marks in 1899. They were exported to the quantity of 295,601 tons at 281,704,000 marks in 1900, against 283,245 tons at 250,455,000 marks in 1899.

Machinery and machine parts in a more restricted sense, but including locomotives and boilers, were imported in 1900 to the extent of 98,684 tons at 77,664,000 marks, against 93,569 tons at 64,712,000 marks in 1899. They were exported to the amount of 233,996 tons at 178,233,000 marks in 1900, against 219,494 tons at 176,241,000 marks in 1899. The old classification of machines, chiefly of wood, cast iron, wrought iron, etc., has given place to a more detailed one specifying the different kinds of machinery imported or exported with even greater detail than that of the United States statistics. Aside from a few classes, such as locomotives, boilers and sewing machines, however, the change covers only 1900, so that year cannot be compared with the preceding one as to details in most branches of the machinery trade. The principal countries with which foreign trade was transacted in 1900 are set forth in a table which we have at hand and from which we publish some excerpts showing the origin and destination of the largest quantities of machinery of some of the leading classes, so far as they are among the countries given in this table.

Locomotives and locomobiles were imported in 1900 to the value of 4,110,000 marks (4,308 tons), against 4,580,000 marks (4,803 tons) in 1899. They were exported to the value of 14,751,000 marks (12,293 tons), against 13,281,000 marks (11,063 tons) in 1899. The principal imports in 1900 were from Great Britain, 3,780 tons, Belgium, 305 tons, and the United States, 294 tons. The chief exports were to Russia, 5,230 tons; Austria-Hungary, 1,115 tons; the Dutch Indies, 1,054 tons.

Agricultural machinery was imported in 1900 to the amount of 28,825 tons at 23,060,000 marks and exported to the amount of 12,955 tons at 10,364,000 marks. By far the greater part imported—20,249 tons—came from the United States, while Great Britain furnished most of the remainder—5,078 tons. The chief exports were to Russia, 6,092 tons; Netherlands, 1,087 tons; Switzerland, 990 tons; Austria-Hungary, 865 tons; Belgium, 781 tons; France, 636 tons; Italy, 489 tons; Roumania, 477 tons; Argentina, 284 tons.

Electrical machinery imports for 1900 were 4,350 tons at 3,915,000 marks and exports 12,918 tons at 11,626,000 marks. The chief countries from which imported were Austria-Hungary, 2,082 tons; Switzerland, 977 tons; Belgium, 401 tons; United States, 343 tons; Great Britain, 239 tons. The chief exports were to Russia, 3,077 tons; Italy, 1,829 tons; Austria-Hungary, 1,197 tons; France, 1,061 tons; Great Britain, 958 tons; Spain, 763 tons; Belgium, 608 tons; Switzerland, 430 tons; Norway, 408 tons; Sweden, 401 tons; Netherlands, 373 tons; Chile, 238 tons; Mexico, 224 tons. Among others were Brazil 107 tons, and Japan 102 tons.

Of steam engines there were imported in 1900, 4,365 tons at 3,273,000 marks and exported 21,555 tons at 14,011,000 marks. The chief imports were from Switzerland, 1,738 tons; Great Britain, 1,061 tons; Belgium, 716 tons; Austria-Hungary, 369 tons; United States, 200 tons. The principal exports were to Russia, 5,586 tons; France, 4,247 tons; Great Britain, 1,889 tons; Belgium, 1,485 tons; Free Port of Hamburg, 1,285 tons; Italy, 969 tons; Austria-Hungary, 935 tons. Among non-European countries, Japan bought 188 tons, the Dutch Indies 269 tons, and Mexico 216 tons.

In the textile line, the imports of cotton machinery were 10,683 tons at 9,777,000 marks and the exports 5,110 tons at 4,599,000 marks. The imports were almost entirely from Great Britain—9,876 tons—while Switzerland sent 612 tons and France 232 tons. The chief exports were to France, 1,688 tons; Austria-Hungary, 1,078 tons; Russia, 1,156 tons, and Italy, 325 tons. The United States bought 112 tons.

Weaving machinery was imported to the amount of 8,184 tons at 3,683,000 marks and exported to that of 8,720 tons at 3,924,000 marks. Of the imports, 6,138 tons were from Great Britain, 1,420 tons from Switzerland and 251 tons from Austria. The largest exports were 1,768 tons to Austria-Hungary, 1,655 tons to France, 1,226 tons to Italy and 787 tons to Russia. To the United States went 394 tons and to Japan 257 tons.

Of wool-working machinery, the imports were 987 tons at 888,000 marks; the exports, 718 tons at 646,000 marks. From Great Britain came 576 tons, from Belgium 210 tons, and from France 162 tons. The chief exports were to France, 180 tons; Austria-Hungary, 149 tons; United States, 147 tons; Belgium, 74 tons; Russia, 39 tons.

Of machine tools were imported 6,429 tons valued at 6,429,000 marks. The exports were 9,267 tons at 6,950,000 marks. The imports from the United States were 4,757 tons; from Great Britain, 588 tons; France, 388 tons; Austria-Hungary, 259 tons; Belgium, 184 tons; Switzerland, 134 tons. The chief exports stated were to Russia, 2,370 tons; Austria-Hungary, 1,236 tons; France, 1,200 tons; Italy, 976 tons; Switzerland, 964 tons; Sweden, 385 tons; Belgium, 344 tons; Great Britain, 250 tons; Denmark, 236 tons; Netherlands, 228 tons; Finland, 174 tons; Japan, 122 tons; Roumania, 61 tons. These figures seem to disprove the contention that German tools had up to the end of the year made very serious inroad into Great Britain.

Turbines were imported to the amount of 258 tons at 155,000 marks and exported to that of 1,158 tons at 695,000 marks. The chief imports were 174 tons from Great Britain and 77 tons from Switzerland. The principal exports were to Russia, 258 tons; Austria-Hungary, 257 tons; France, 126 tons, and Switzerland, 72 tons.

Transmission machinery imports were 273 tons at 150,000 marks, and the exports 2,113 tons at 1,162,000 marks. From Austria-Hungary came 75 tons; from Belgium, 45 tons, and from the United States, 40 tons. The largest exports were to France, 392 tons, and Russia, 381 tons.

Of pumps were imported 1,185 tons at 711,000 marks, and exported 5,709 tons at 3,425,000 marks. The principal imports were from the United States, 331 tons; Switzerland, 224 tons; Belgium, 164 tons, and Austria-Hungary, 158 tons. The chief exports were to Russia, 1,669 tons, and Austria-Hungary, 1,252 tons.

Of ventilators for industrial purposes were imported 139 tons at 111,000 marks, and exported 429 tons at 343,000 marks. The chief imports were from Great Britain, 53 tons. The largest exports were to Austria-Hungary, 128 tons, and Russia, 79 tons.

Of blowing machinery were imported 1,184 tons at 888,000 marks, and exported 408 tons at 265,000 marks. The chief imports were from Belgium, 937 tons, and Great Britain, 61 tons. The largest exports were to France, 133 tons; Belgium, 87 tons; Austria-Hungary, 64 tons; Russia, 63 tons.

Rolling mill machinery imports were 995 tons at 796,000 marks, and the exports 6,308 tons at 5,047,000 marks. The imports were chiefly from Great Britain, 473 tons; Belgium, 268 tons, and the United States, 77 tons. The principal exports were to France, 2,405 tons; Russia, 1,323 tons; Belgium, 893 tons; Austria-Hungary, 488 tons; Great Britain, 423 tons; Japan, 328 tons; Italy, 233 tons.

Steam hammers were imported to the quantity of 132 tons at 86,000 marks, and exported to that of 398 tons at 259,000 marks. The chief imports were from Great Britain, 70 tons. The chief exports were to Portuguese East Africa, 148 tons; Belgium, 58 tons; Russia, 36 tons; Italy, 19 tons.

Metal punches and shears were imported to the amount of 553 tons at 304,000 marks, and exported to that of 1,626 tons at 894,000 marks. The chief imports

*A mark equals about 24 cents.

were from Great Britain, 210 tons; United States, 102 tons; France, 94 tons; Belgium, 71 tons. The principal exports were to Austria-Hungary, 475 tons; Russia, 310 tons; Switzerland, 177 tons, and France, 161 tons.

Hoisting machinery imports were 1,666 tons at 1,249,000 marks, and the exports, 3,520 tons at 2,640,000 marks. The imports came principally from the United States, 574 tons; Italy, 339 tons; Great Britain, 283 tons, and Belgium, 126 tons. The exports were chiefly to Russia, 632 tons; Free Port of Hamburg, 411 tons; Austria-Hungary, 244 tons; Netherlands, 238 tons.

Milling machinery was imported to the amount of 1,055 tons at 844,000 marks, of which the greatest quantities came from Switzerland, 389 tons; Great Britain, 236 tons, and the United States, 182 tons. The exports were 6,107 tons at 4,886,000 marks, of which the greatest amounts went to Russia, 1,219 tons; Austria-Hungary, 723 tons; Norway, 684 tons; France, 524 tons and Belgium, 520 tons. Brewing and distilling machinery, boilers and sewing machines are also classified.

Other machinery for industrial purposes was imported to the extent of 17,521 tons at 13,140 marks, and exported to that of 100,775 tons at 75,581 marks. The chief imports were from Great Britain, 6,466 tons; Belgium, 3,377 tons; United States, 2,774 tons; Austria-Hungary, 1,593 tons; France, 1,180 tons; Switzerland, 900 tons; Netherlands, 477 tons; Sweden, 226 tons; Denmark, 131 tons. The principal exports were to Russia, 13,278 tons; Austria-Hungary, 12,373 tons; Italy, 10,663 tons; France, 8,721 tons; Belgium, 7,066 tons; Spain, 6,324 tons; Switzerland, 5,636 tons; Netherlands, 5,561 tons; Great Britain, 4,404 tons; Dutch Indies, 4,338 tons; Roumania, 2,975 tons; United States, 2,367 tons; Denmark, 1,431 tons; Finland, 1,447 tons; British Australasia, 1,205 tons; Argentina, 1,079 tons; Norway, 1,048 tons; Mexico, 940 tons; Japan, 831 tons; Free Port of Hamburg, 729 tons; Brazil, 666 tons; Chile, 524 tons; Sweden, 3,042 tons; Servia, 1,105 tons.

Commercial Review.

NEW YORK, Friday, March 22.

MACHINE TOOL MARKET.

The prevailing tone in the local market is a moderately cheerful one. It denotes a continuance or expansion of sales which in February outdistanced January. Here and there, as always, are to be heard discordant notes, such as a complaint that manufacturers are evincing an anxiety to consign goods to the dealer, that inquiry does not hold its own with sales, or that some of the New England tool-building shops are slack, which, we are aware, is anything but a fact of certain of the leading ones. One of the favorable symptoms is that a local tool manufactory is building a large quantity of special machinery for shops in various places which are said to be starting energetically at work and putting on double forces. A comment that few tools are seen being carted on trucks through Liberty street in these days is offset by one from the same observer that manufacturers are making good shipments to the Far West.

One of the things which shows the tool market to be still in a strong position is the continued scarcity of second-hand tools. These were absorbed two years ago when there were not enough new ones to go around and the fact that a new supply has not been turned loose upon the market indicates prosperity among the machine shops. A lot of second-hand tools was, however, sold out at auction on Cliff street, New York, last week and the prices said to have been fetched were remarkable. A shaper which in four years has passed through several hands brought $10 more than it cost new. A hacksaw which dealers buy from the maker at $16.50 and retail at $18 was bid up to $19. One or more engine lathes also proved notably profitable.

No news has been received that the British Westinghouse contracts have yet been awarded, and much of the Rock Island deal appears to be pending still. It is said that a secret meeting of government officials from Rock Island, Washington and Springfield, Mass., will be held to consider the matter.

While there is little or no change in the immediate German tool situation a somewhat hopeful note is sounded by an authority especially well informed on this market. He thinks that instead of being on the brink of deeper and far-reaching calamity the industrial affairs of that nation are destined to improve before long with the re-awakening of trade in South Africa and China, the loss of which was one of the chief causes of the depression, and that there will be a steady demand for American tools. American builders are now disposed to pronounce German trade absolutely *nil*, but in reality the sales of our tools in that country are better than is evidenced by order books of manufacturers. The reason for this is that foreign dealers were stocked up before the slump and with the diminished volume of trade are able to meet current demands for a considerable time without heavy drafts on the manufacturers. The statistics of one of the large German importing houses show that orders placed by them for American machine tools in the latter half of 1900 were, in some instances, more than 50 per cent. below those placed with the same companies during the former half of the year. For machinists' small tools, however, the demand has fallen off less and in certain cases the orders for those in the latter half of the year surpassed those for the former half.

Last week we mentioned the exorbitant differences the German Wire Nail Syndicate was making between domestic and export prices. A letter to the "American Machinist" has since been received from Consul Simon W. Hanauer, Frankfort-on-Main, Germany, in which he says that the goods shipped direct to foreign countries were sold at 14 marks per metric hundredweight, while those sold to home dealers brought 25 marks. "This enormous difference in price in favor of foreign purchases," he continues, is to be found in other lines of German industrial production and causes much complaint on the part of German home consumers." To similar effect is an official report from Consul-General Guenther at Frankfort, who bases his information upon the authority of the "Frankfurter Zeitung: "The price of wire nails in Germany is fixed by the trust at $2.70 per 100 pounds; for export, however, at only $1.51 per 100 pounds. The German consumers have to pay an excessive price in order to enable the trust to sell its surplus to foreign countries at greatly reduced figures. And still the trust asks an increase of duties of 7 marks ($1.67) per 220 pounds. The present tariff is 3 marks (71.4 cents) per 220 pounds."

Steps are being taken to determine the legality of the countervailing duty on sugar from Russia. A protest to that end has been filed with Collector Bidwell by the attorney for Gustave A. Jahn & Co., who were one of the importers of the sugar arriving on the ship "Darlington" a few weeks ago, and the case has reached the Board of General Appraisers at New York. The case may reach a hearing this week and be determined quickly if the opposing counsel can agree on the facts. Otherwise it might be necessary to take the testimony of United States officials in Russia, causing a delay of six months or more. But even if the Russian tariff order should be revoked it may be that Russia will not care to buy machinery in the future since she has found out a cheaper way to get it. The railway workshops of Tongshan and Shan-hai-kwan, according to "Indian Engineering," have been denuded by the Russians of all machinery and materials, and only the bare walls left.

Items of machinery news from India are, that it is proposed to enlarge the Locomotive Yards at Lahore, possibly increasing the machine shop; also that the Bengal Iron and Steel Company is about to lay down a large steel plant for the production of rails and bars.

The Treasury Department has rendered a short decision in connection with Section 19 of the present tariff, wherein it is provided that machinery imported for repairs may be brought in free of duty. Permission was asked for the importation, under this paragraph, of 179 sheets of new steel, which were to be flanged and punched by a large boiler company and then returned to Canada. The ruling is

to the effect that such sheets are in no sense machinery; that the work to be put upon them was not in any way in the nature of repairs, as the word in that section is held to relate to the mending, renewal or restoration of parts of old or used machinery.

CHICAGO MACHINERY MARKET.

Without a known exception, sellers of machine-shop supplies in the West report trade in excess of that of a year ago. In many instances the volume of business is unprecedented. There is a steady call for everything consumed in the operation of manufacturing plants, and an air of cheerfulness pervades the trade. This is the general situation. A few factors of the trade say they are in a measure disappointed. They had expected a larger business than has actually materialized. They are doing better than a year ago, but they had expected to do a great deal better. In March, 1900, the strike of the machinists and of the building trades were brakes upon activity, effecting in some instances a decrease of 50 per cent. in sales of supplies. If there were absolute assurance that this present year were to be free from labor disturbances the present situation might look a little brighter, but as it is the prospect is very fair indeed.

The shadow of possible labor differences is the only unfavorable symptom of trade. A shop superintendent alludes to what seems to him a growing disinclination among the men to adopt improved tools, or any facility for increasing output with no corresponding increase in the number of men employed. Several improvements of this sort have met, he says, with disfavor in the shop. Allusion is here made thereto for the reason that it is the only subject mentioned by the trade that is not of a nature encouraging to the market.

As spring opens, the direct evidences of factory growth appear. Extensions and new plants are projected in large number and only await seasonable weather for active construction. It is suggested by one supply man that by the beginning of June those manufacturers of supplies which are used in shop equipment will have all the business they can possibly do. It was thought last year that the cement industry was overdone. But many new plants will be constructed this year. If the Nicaraguan canal is built it will require the output of all American cement works for a year to supply that need. Beet-sugar works continue to spring up. An area of 5,000 acres devoted to sugar-beet production in 1897 became 75,000 acres in 1901. The same rate of growth in another three years will make an impressive showing. Lumber interests in the Southwest are extremely active, but in the Northwest have been delayed by unfavorable weather. Machine-shop activities are generally brisk.

The Armstrong Bros. Tool Company were never so busy as now, except during the hight of the boom, two years ago. One of their late orders for a round lot of tools was from the Washington Navy Yard. The Reeves Pulley Company western trade is far ahead of last year. The Chicago office will remove to an adjoining storeroom, May 1, with four times their present space, which they have outgrown.

CINCINNATI REPORT.

If the opportunities which seem to be suggested by recent activity in the electrical machinery market all materialize, manufacturers of that character of material anticipate a heavy trade the rest of the year. The boiler men also come in for a share in this estimate. From New Albany, Ind., comes the news of a revival of a project to utilize the power of the falls in the river, and this time it is claimed the deal will go through. If so, there will be opportunities for all manufacturers of power apparatus in connection with street railways, electric-light plants and many of the largest factories of Louisville, New Albany and Jeffersonville.

Local material men in the line of electric railway equipment note improvement in that market. The Electric Railway Equipment Company has just made some heavy shipments to England of material to be utilized in work on city lines. From South America also comes inquiry, and from China and Japan.

Boiler manufacturers have closed some large contracts, among which may be mentioned: 2,400 horse-power in six units of 400 horse-power each, for the new mill of the Champion Coated Paper Company, in Hamilton, which, it is said, will be the largest in the Ohio valley. The order with the Stirling Company calls for 3,200 horse-power of water-tube boilers, the remainder of the order to be filled later.

Sellers of electrical machinery for power and municipal plants are pleased with current conditions, one local firm reporting business for February and March 100 per cent. better than the same period last year. This same concern is now booking orders for next August and September delivery. The remodeling and enlargement of the Newport Rolling Mills, Newport, Ky., has furnished business for the boiler men and electrical people. This company has just purchased of The Triumph Electric Company one 100-kilowatt generator and four motors aggregating 32½ horse-power.

The Bullock Electric Company has booked an unusually large complement of orders, well diversified, for motors and generators.

There has been more than the usual personal inquiry in the local machine-tool market, several visitors buying heavily during the week. W. H. Vandervoort, of Champlain, Ill., purchased, through the Marshall-Huschart Company's Cincinnati house, the entire equipment for a new gas-engine manufactory. Among those who profited were the Cincinnati Milling Machine Company, the Bickford Drill & Tool Company and the Bradford Machine Tool Company. A large concern in Columbus is in the market for lathes, milling machines and other tools. The Bradford Machine Tool Company reports the best month for a year. This company has shipped some goods to Portugal recently. The Cincinnati Machine Tool Company is finishing plans for an addition to the erecting shops. The Lodge & Shipley Machine Tool Company has enjoyed what may be termed a steady run of satisfactory business since the first of the year.

Business with practically all local manufacturers in the iron-working machinery class is domestic; there is very little export; the whole will not aggregate more than 8 or 10 per cent. One of the leading machine-tool concerns has just received a couple of orders from Melbourne, Australia. Inquiry from Santiago, Chile, asks for representation of the line manufactured by a prominent Cincinnati concern.

Reports from up the State indicate that some powerful influence is at work in the interests of the independent steel makers.

Quotations.

NEW YORK, Monday March 25.

Iron—Pennsylvania Pig, Jersey City delivery:

No. 1 X foundry	$16 00 @ $16 50
No. 2 X foundry	15 25 @ 15 75
No. 2 plain	14 25 @ 15 00
Gray forge	14 00 @ 14 50

Alabama Pig, New York delivery:

No. 1 foundry, or soft	$16 00
No. 2 foundry, or soft	15 50
No. 3 foundry	15 00
Foundry Forge, or No. 4	14 50

The Southern prices given here are based on to-day's information from a prominent source, but it is said that some of them could be shaded in some quarters, while for special grades or small quantities, still higher figures might be demanded.

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.50 @ 1.60c.; from store, 1.75 @ 1.90c. Some dealers have raised store prices to 1.80c. minimum.

Tool Steel—Base sizes—Standard quality, 7c.; extra grades, 10c. upward.

Machinery Steel—Base sizes—From store, 1.85 @ 2.00c.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 3c.

Copper—Lake Superior ingot, 17c.; electrolytic, 16⅝c.; casting, 16⅝c.

Pig Tin—25¾c. for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½c. extra for carloads.

Spelter—3.85 @ 3.90c., New York.

Antimony—For 5-cask quantities, Cookson's, 10⅜ @ 10½c.; Hallett's or United States, 9c.; Japanese, Hungarian or Italian, 8.70c.

Lard Oil—Prime City—68 @ 69c. in barrel lots; 67c. in jobbing quantities.

Progress in American Railroad Shops.

We take pleasure in reproducing the following from the address of George W. West, upon recently assuming, at Buffalo, the presidency of the Central Railway Club for the current year:

I have always had a warm place in my heart for Buffalo, and a deep interest in this Central Railway Club. It was here that I first obtained my start as a master mechanic, and I was thinking, out at East Buffalo a few days ago, that less than twenty years ago, where now stand the Pullman Shops, facing two elegantly paved streets or avenues, was a mudhole, and country roads, not ankle deep but knee deep. My interest in the club has been best illustrated by my attendance and the distance covered to come here. A great deal has been said recently in relation to Messrs. Hill, Morgan, Rockefeller and Vanderbilt—community of interest and community of ownership, and I ask you gentlemen whether or not, with all due respect to these men, this same idea of community of interest was not conceived in the establishment of these railroad clubs? I have been called an enthusiast in railroad club matters, and I am glad to be such. I go back to what we may call the ante-club period, and while I very much dislike to give my friend Macbeth away, as being old enough to remember an incident or two that I am about to relate, I think he will bear me out, that when we started railroading—you remember Macbeth hasn't always been a master car builder; he was poor once as I am now (laughter)—we were in the employ of the New York Central when it was not the great trunk line or system that it is to-day, and I recall very forcibly the fact that when we first met there was no known method on the New York Central system of fitting a driving-box brass to the bearing except with a slotter, and there was but one slotter on the entire system. The shop with which I was connected was not fortunate enough to have a slotter, and the only fitting the brasses got and the box, as they came from the foundry, was with the "Armstrong" file and chisel, and it was not until 1886, when I went to a shop at Cleveland, that I saw a little device that did not cost ten dollars which could be attached to any planer, that did this work. Now, the humiliating part to me is that in all our experience on the New York Central, there was not brains enough, including Mac's and my own, to devise a means of doing this work without the slotter. This little device would do more work in one day than the slotter would in two. I recall also another practice. You might call it a shop practice. At Schenectady, where I was first connected with the New York Central, there were but two men that could set, or were allowed to set, the locomotive valves, and frequently these men would do that work at night or after shop hours, to preclude the other men catching onto how it was done. Now, these were the days before we had railroad clubs. What are the circumstances to-day and what are the conditions and what has brought these different conditions about but this fact of our distributing knowledge to each other here? We do not confine ourselves to any one man's brains and the railroad companies have reaped the benefit of it.

Indexing Technical Literature.

BY D. T. RANDALL.

The interest in the subject of indexing made manifest by the number of letters which have been received regarding the method described in the "American Machinist" No. 52 of last year, together with the article on "Co-operative Indexing," in issue No. 3 of this year, seems to warrant a few more words on the subject. One or two ideas advanced in the above-mentioned article deserve some attention.

Regarding the value of an index of articles one has read and indexed for himself, the conclusion arrived at by those who have had experience is, that it is of great value. No one can remember all the facts he has read, though he may remember having seen them and wish to find them again. Several personal acquaintances are keeping up an index, and many letters recently received have stated that the writers have such an index. This goes to show that quite a number of people find time to do such work, and that it is of sufficient value to justify the trouble. The very fact that, when indexing, one has to keep in mind an outline of the subject and form an opinion of each article read, gives it a decided educational value. The time required to make out an index card is short—not more than four or five minutes. A card index may be made to do duty as a note book, by gathering facts and formulas on cards which may be referred to immediately. Papers or periodicals which may be cut apart should be marked as soon as read, and the articles may then be cut and filed at one's convenience. The time saved by an index far exceeds the time required to make it.

While the suggestion of a co-operative index is an excellent one, the tone of the article is such as to discourage anyone from starting an individual index. The policy of not taking anything because one cannot have it all is one not calculated to lead to success. It will no doubt be a long time before such an index as the one suggested will be published; and it will come about much sooner if engineers do not wait, but get the best to be had at present. In case such an index is to be published, individuals who have read and carefully indexed will be in a position to furnish the most valuable material. It is advisable for anyone who feels the need of an index to begin to make one and add to it by exchanges with acquaintances who may be indexing.

A definite plan of indexing was formed about five years ago in the mechanical engineering department of the University of Illinois, and it has been developed and perfected until at present it is very satisfactory. At first but little more than the title, author's name and the book or periodical in which it was published, were written on the cards. But later on more complete information regarding the length and nature of the article is always given. Each senior and post graduate student is required to read and index one or more periodicals or books devoted to the subject of mechanical engineering. Their cards are handed in to the department. Copies are made and placed on file in a case, always available to other students. The original cards are returned to the students who handed them in. This index is growing in size and value every year. It contains a complete index of the Transactions of the American Society of Mechanical Engineers and of the Proceedings of the Institute of Mechanical Engineers, also an index of the leading engineering periodicals for the past five years. It consists now of about 3,500 cards, divided among the several subjects in about the proportion in which they are published. For example, about 1,400 relate to steam engineering, 100 to air and gas engines, 125 to air compressors and ice machines, 235 to transmission machinery, 200 to engineering works and factories, and so on for each subject. These cards may be copied by anyone who cares to do so, and many of the students take advantage of the opportunity. It will be noted that here is a co-operative index which has been in operation during a period of at least five years. Two or three years ago the department considered the advisability of extending the usefulness of this index, but all plans for publication seemed too expensive to justify the experiment, and the project has been given up. However, in a recent conference with the head of the department regarding the possibility of making this index available to others in some way, authority was given to the writer to say that any library, engineering society or individual who will pay for the actual cost of cards, copying on typewriter or by hand, postage and any other necessary expenses, will be furnished a copy of the index by the department. The cost to the department is about ¼ cent for the card and 1¼ cents for copying on typewriter—a total of about 1½ cents per card. The above offer is made in a purely educational and not in a commercial spirit, and it is hoped no book-keeping or unnecessary correspondence may result. The Western Society of Engineers, 1736 Monadnock Block, Chicago, have already availed themselves of this

opportunity, and have on file at their office a nearly completed copy of the index. Requests for copies of the pamphlet on indexing* have been so numerous that but few are left. A new and revised edition is now ready for the press. Changes have been made in some cases in order to overcome difficulties experienced in the use of the old one, due to the growth of the index and to the rapidly increasing number of subjects.

Keyseat Milling Machine.

The accompanying half-tones illustrate a new machine for sinking keyseats in shafts. Its novelty lies in the provision of a vertical end mill for finishing the ends of the keyseats without drilling, the work being finished at a single setting in the machine.

Fig. 1 shows the general appearance of the machine and the two cutters which are in line in a vertical plane. The first operation is shown upon an enlarged scale in Fig. 2, and the finishing operation in Fig. 3. These views speak for themselves, regarding the nature of the work and the adaptation of the machine it it. One feature, however, needs to be described. Four stop-screws are provided to limit the cross movement of the saddle on the bed parallel with the main spindle. Two of these are in view in Fig. 1, and the other two are behind the carriage, located to limit the movement in the opposite direction. These stops are so located that when the saddle is moved over to abut the inner pair, the main cutter will be central over the V-blocks, and when the saddle abuts the outer pair the vertical spindle cutter will be central. The proper alinement of the two cuts with the shaft and with each other is thus insured, and no time is lost in changing from the first cut to the second one. Ordinary stock cutters are used, and to provide for using these without re-setting the stops for every change in width, a set of standard-thickness washers is provided which go on the arbor between the cutter and the arbor collar. The washers grow thinner as the cutters grow thicker, their thickness being such as to bring the cutter central with the shaft when the saddle abuts the back stops. Each washer is kept on the peg with its cutter, and in setting up the machine it is only necessary to put the washer on the arbor first, to insure that the keyseat will be properly located on the shaft. A suitable size end mill completes the outfit of tools for each size of keyseat.

One of the V-blocks is mounted on a wedge base to permit a tapering keyseat to be cut if desired, or to accommodate a shaft of different diameters at the two ends. The overhanging arm is hollow, and acts as an oil reservoir.

In operation the saddle is first moved to the back stops, the main cutter is sunk to its depth by hand, and the automatic feed is then thrown in. The first cut completed, the cutter head is raised and the saddle is brought out to the outer stops, when the end mill soon completes the ends of the keyway.

The machine is the product of the Newton Machine Tool Works, of Twenty-fourth and Vine streets, Philadelphia.

*An extension of the Dewey system of Classification to Technical Literature—Ed.

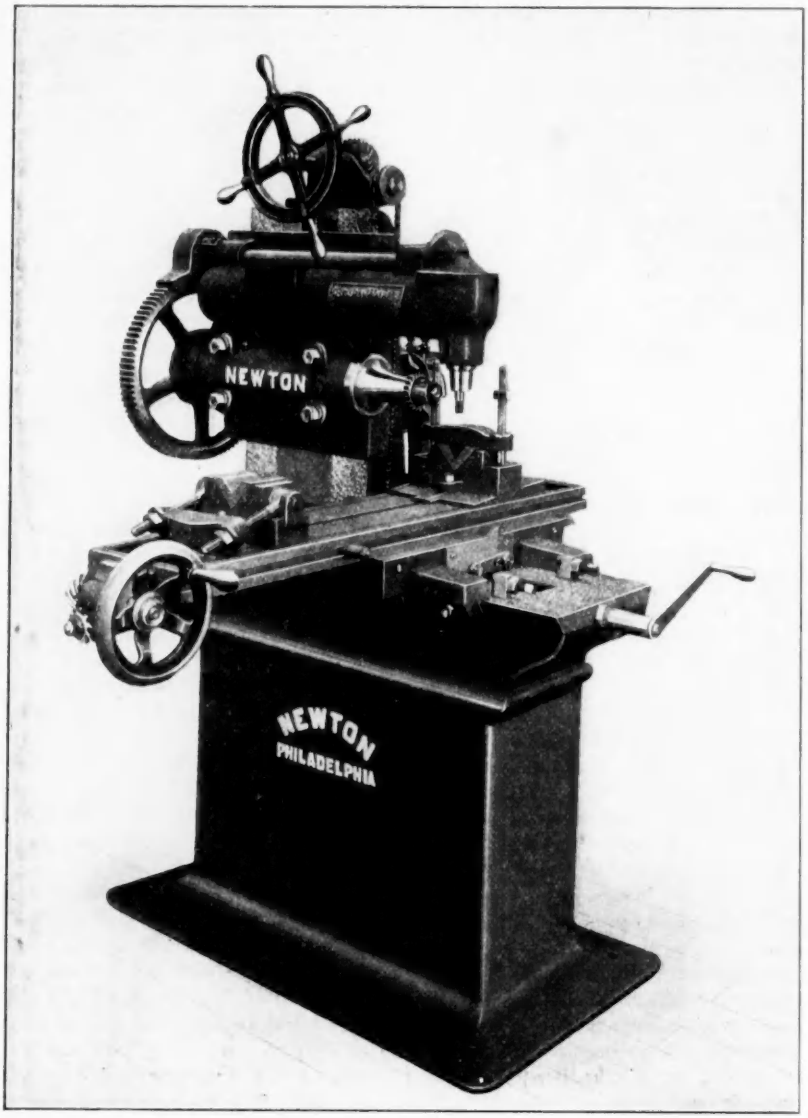


FIG. 1. KEYSEAT MILLING MACHINE.

An Armature Disk Notching Machine.

The cut shows the essential features of an automatic armature disk notching machine. It comprises a complete vertical punch, to which is attached an adjustable mounting for the disks to be notched, and an automatic feed for rotating the disk after each stroke of the punch. The disks are held horizontally between the two flat plates mounted on the vertical spindles. The upper spindle and plate are raised by throwing down the lever *F*, when the disk can be inserted, and when the lever is returned to the position shown the disk is securely clamped and the lever is locked. This disk mounting is moved in and out by rack and pinion operated by hand-wheel *E*, for different diameters of disks, and when adjusted the carriage is clamped. The spindle which carries the lower plate has a worm-wheel on its lower end, and a worm *B* on a horizontal shaft is rotated by the ratchet wheel *A* on the end of it. The stroke of the pawl is adjustable for any number of teeth, and with change of the ratchet wheel, which is done by a single turn of a nut, any number of notches may be cut. The use of the worm-gear movement eliminates the inaccuracies sometimes caused by the momentum of the rotating parts. When the machine is started correctly, it cuts all around the disk automatically, and then, by setting the lever *D*, it is arranged to automatically stop. The spacings of the disks by this machine are said to be as accurate as can be obtained by any machine now used for the purpose. The machine is built by the Toledo Machine and Tool Company, Toledo, Ohio.

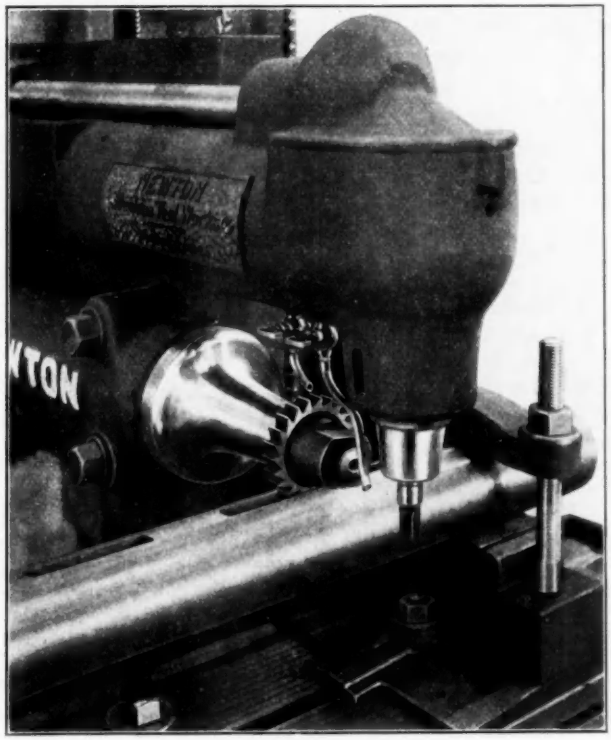


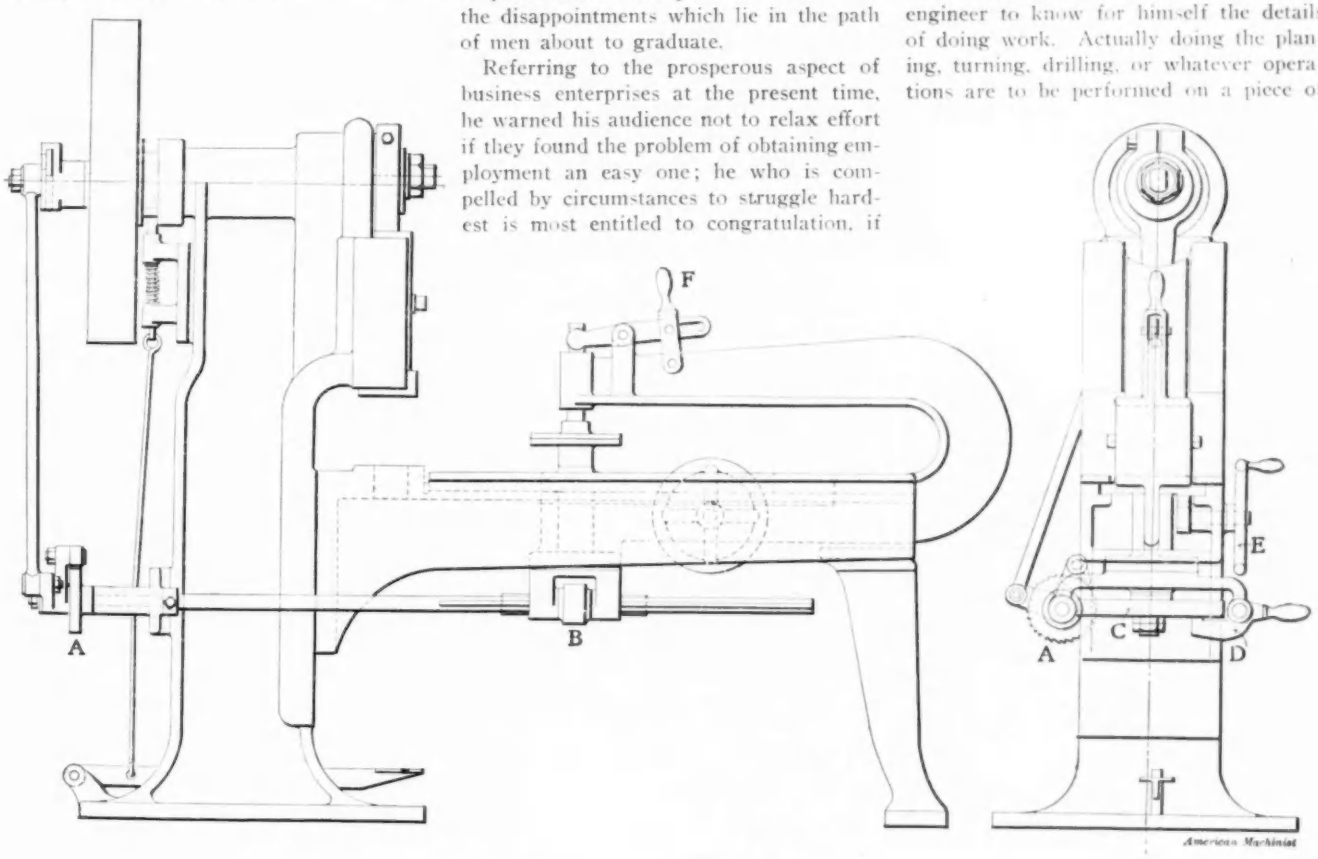
FIG. 2. THE FIRST CUT.

FIG. 2. COMPLETING THE KEYSEAT.

Business Suggestions For Technical Students.

Mr. E. M. Herr, general manager of the Westinghouse Air-Brake Company, recently addressed the students of Purdue University on "Some Problems in the Business Life of a Technical Graduate." Speaking from a wide experience and with a strong feeling of sympathy for his student audience, Mr. Herr was able to anticipate some of the pleasures as well as the disappointments which lie in the path of men about to graduate.

Referring to the prosperous aspect of business enterprises at the present time, he warned his audience not to relax effort if they found the problem of obtaining employment an easy one; he who is compelled by circumstances to struggle hardest is most entitled to congratulation, if progress and advancement are his object. In emphasizing the advantage to the technical graduate of a thorough shop apprenticeship, Mr. Herr discussed the necessity for reducing shop cost in manufacture, and showed how necessary it is for the engineer to know for himself the details of doing work. Actually doing the planing, turning, drilling, or whatever operations are to be performed on a piece of



AN AUTOMATIC DISK NOTCHING MACHINE.

work, is by no means all of the labor which the job includes. The handling to and from the tool may, and in many cases does, cost more than the machining. Always avoid reducing cost at the expense of either efficiency, accuracy or durability. This may enable one to make a favorable record for a while, but will eventually bring disaster and increased expense for maintenance or operation in railroad work, or loss of patronage and reputation in manufacturing.

To shirk or fail always weakens the shirker and lessens confidence, whereas every responsibility successfully borne becomes a stepping-stone to greater success.

Once having been appointed to an executive position, the details of which were new to him, the speaker had called upon the general superintendent, to whom he was to report, for final instructions before proceeding to his post. In response to his questions as to whether there were any instructions to be given, he received the reply: "No instructions! The machine is running down there; don't stop it until you are sure you can start it again!"

It is easy to work when everything runs smoothly—when, to use a homely phrase, things are coming your way; but a time is likely to come when your most carefully laid plans are likely to be overturned, and you fail perhaps through no fault of your own, but apparently because some other person has been a little careless, or inattentive, or has lacked judgment; with the result that your work has not materialized and you yourself are subjected to criticism. It is then very difficult to have the patience to carefully and more thoroughly than before go over the old ground, and with greater pains and care reconstruct a more secure foundation, avoiding the weakness which caused the former failure, whether in men or materials, and thus finally bringing success from apparent failure.

After thus inspiring his audience with the dignity of the demands which would be made upon them, Mr. Herr described in detail the organization of a large manufacturing establishment, showing the purpose of each department and the dependence of one on the other. He traced the movements which are made between the receipt of an order and the shipment of the machine ordered. In conclusion, he said: "Be kind and considerate to your fellows, courteous and obedient to those in authority, and strive always to do a little more than is expected of you, and I can safely promise that there will, in your case, be no such word as fail."

A way to remove a broken-off stud without enlarging the hole, is to drill it out to as near the size as possible with a left-hand ratchet brace and drill, using kerosene. The oil will enter through the shell in places broken by the drill, and the friction of the left-hand drill will often loosen it.—"Eng. & Iron Trades Adv."

Spacing Circular Work on the Universal Milling Machine when the Index-Plate is Geared to the Index-Spindle.

BY OSCAR J. BEALE.

In the "American Machinist" No. 3, 1901, there is an article by Mr. Wm. Pilton that describes Mr. Ben Noble's method of spacing for prime numbers in a universal milling machine, to which the editor adds a few comments.

This article is the most remarkable of all the articles I have ever read in the "American Machinist." Mr. Noble's method is good, but nearly every statement, both of Mr. Pilton and of the editor, is incorrect.*

The method described by Mr. Pilton consists in disengaging the index-plate anchoring-pin and gearing the index-plate to the index-spindle so that, in moving the crank from one index-plate hole to another, the crank will really move through a different arc from that included between the two index-plate holes. For example, if the crank is moved a turn in relation to the index-plate the crank will really move more than a turn, if the plate rotates in the same direction as the crank; and the crank will move less than a turn if the plate rotates in the opposite direction to the crank.

This method is ingenious, and the calculations for the gears to rotate the index-plate at the right velocity ratio to the index-spindle in connection with the correct movement of the crank in relation to the index-plate form an interesting study.

It is, of course, well known that the number of turns of an index-crank, required at each indexing for any number of divisions of a circle, is equal to the quotient obtained by dividing the number of turns the index-crank takes to make one turn of the spindle by the number of divisions required. This holds good for whatever number of turns the crank takes to make one turn of the spindle, whether the number is whole or fractional. For convenience, I will call the number of turns that the index-crank takes, in relation to the index-plate, to make one turn of the index-spindle, *the index-reckoning number*. In an ordinary universal milling machine, 40 turns of the index-crank make one turn of the index-spindle, and when the index-plate is anchored the index-reckoning number is 40. By the ingenious De Leeuw method, we can change the index-reckoning number at will. For example, if the index-plate is geared to the spindle, and the plate rotates at the same rate as the spindle and in the same direction as the crank, the *index-reckoning number* is 39, because when the crank has made 40 turns, and the spindle has made 1 turn, the crank has passed a given point on the index-plate only 39 times; and if we stop the crank every time it overtakes the same point on the plate, and make a cut, we shall divide into 39 parts. Again, with the same gearing ratio of 1 to 1, and the plate rotating in the opposite direction to the crank, the index-reckoning number is 41, because when the crank has made 40 turns it has met the same point on the index-plate 41 times; and if we stop and make a cut every time the crank meets the same point on the index-plate, we shall divide into 41 parts.

When the index-plate is geared to rotate half a turn while the spindle makes one turn and the crank 40 turns, if the plate rotates in the same direction as the crank, the index-reckoning number is 39½; and if the plate rotates in the opposite direction to the crank, the index-reckoning number is 40½.

In general, if the plate rotates in the same direction as the crank, subtract the turns of the crank to 1 turn of the spindle from the turns of the crank to 1 turn of the spindle, and the remainder is the index-reckoning number; if the plate rotates opposite to the crank, the index-reckoning number is the sum of the turns of the plate to 1 turn of the spindle added to the turns of the crank to 1 turn of the spindle. For example, if the number of turns of the crank to 1 turn of the spindle is 60 and the index-plate is geared to rotate ½ turn to 1 turn of the spindle, the index-reckoning number is 59½ when the plate rotates in the same direction as the crank, and 60½ when the plate rotates opposite to the crank.

With the index-reckoning number 39 we can divide just the same as if the index-wheel had 39 teeth and the worm 1 thread. With the index-reckoning number 60½ we can divide the same as if the index-wheel had 121 teeth and the worm 2 threads.

As the quotient of the index-reckoning number, divided by any required number of divisions, equals the turns of the index-crank at each indexing, it follows that the quotient of the index-reckoning number divided by any number of turns of the crank at every indexing will be the number of divisions that will result from that indexing.

There is no doing anything understandingly with this new method, until the index-reckoning number is thoroughly understood. I have explained this number to some that seemed to understand it so long as it was a whole number, but when it was fractional they became confused and I had to go back and explain again.

By assuming different index-reckoning numbers and dividing them by different turns of the crank we can use the quotients to make up a table of divisions that can be obtained by the new method.

Beginning with 1 rotation of the plate

*This method is essentially the same as the one described by Mr. De Leeuw in our issue No. 40, of last year. The principle introduced is the reaction of a train of gears upon the indexing shaft, whereby the normal indexing movement produced by a given movement of the shaft is modified. As we believe this to have been invented by Mr. De Leeuw, we would suggest that it be called, in future, the De Leeuw method—ED.

to 1 turn of the spindle, and the plate rotating in the same direction as the crank, we subtract the 1 rotation of the plate from the 40 turns of the crank and have the remainder 39 as the index-reckoning number. With this arrangement 39 divisions can be made by placing the crank-pin in the same index-plate hole at every indexing.

If the crank makes 3 turns, in relation to the plate, at every indexing, we have $39 \div 3 = 13$ divisions. If the sector is set to indicate $\frac{2}{7}$ turns of the crank, or 21 holes in a 49-hole circle, we have $39 \div \frac{2}{7} = \frac{39 \times 7}{3} = 91$ divisions.

For $\frac{1}{3}$ turn, or 13 holes in a 39-hole circle, we have $39 \div \frac{1}{3} = 117$ divisions.

For $\frac{3}{11}$ turns, or 9 holes in a 33-hole circle, we have $39 \div \frac{3}{11} = 143$.

For $\frac{3}{13}$ turns, or 9 holes in a 39-hole circle, $39 \div \frac{3}{13} = 169$.

It will thus be seen that, with this arrangement, divisions can be obtained equal to 13 multiplied by an odd number.

Fig. 1 shows the plate geared to the spindle 1 to 1. The sector is set to indicate $\frac{1}{3}$ turn, and the machine is ready for 117 divisions. With an intermediate gear or idler in action, as shown, the plate rotates in the same direction as the crank. Mr. Pilton makes the mistake of saying that the plate rotates in the opposite direction to the crank when the idler is in action.

With the same ratio of 1 to 1, and with two idlers in action which make the plate rotate in the opposite direction to the crank, we add the 1 rotation of the plate to the 40 turns of the crank and have 41 as the index-reckoning number. With the sector indicating $\frac{1}{3}$ turn, we have $41 \div \frac{1}{3} = 123$ divisions.

If we gear to drive the index-plate 2 to 1, we shall have the index-reckoning number 38 when the index-plate rotates in the direction of the crank, and 42 when the plate rotates opposite to the crank.

With 38 we can obtain divisions equal to different multiples of 19. Thus, with the sector set to $\frac{2}{3}$, we have $38 \div \frac{2}{3} = 57$.

With 42 we can obtain mutiples of 7. Thus: $42 \div \frac{2}{3} = 63$; $42 \div \frac{6}{11} = 77$.

If we gear to drive the index-plate 3 turns to 1 turn of the spindle, we shall have the index-reckoning number 37 when the index-plate rotates in the same direction as the crank, and 43 when the plate rotates opposite to the crank. Fig. 2 shows the spindle geared to rotate the index-plate 3 turns to 1 turn of the spindle. Two idlers are in action which rotate the spindle in the opposite direction to the crank, and the index-reckoning number is 43. The sector is set to indicate $\frac{1}{3}$ turn of the crank in relation to the index-plate and the machine is set to divide $43 \div \frac{1}{3} = 129$.

When figuring with a fractional index-reckoning number, the reasoning is exactly the same as with a whole number. Let us gear to rotate the index-plate $\frac{1}{2}$ turn to 1 turn of the spindle. When the plate rotates the same way as the crank, we subtract the $\frac{1}{2}$ turn of the spindle from the 40 turns of the crank to 1 turn of the spindle, and the remainder $39\frac{1}{2}$ is the index-reckoning number, which, expressed as an improper fraction, is $\frac{79}{2}$. If the sector is set to indicate $\frac{1}{2}$ turn of the crank, we have $\frac{79}{2} \div \frac{1}{2} = \frac{79 \times 2}{2 \times 1} = 79$; that is, if the index-reckoning number is $39\frac{1}{2}$ and the sector is set to indicate $\frac{1}{2}$ turn, the machine is ready for 79 divisions. If, at every indexing, we move the crank 1 turn in relation to the index-plate, we shall have $39\frac{1}{2}$ divisions to 1 turn of the spindle, and if we continue around again we shall add $39\frac{1}{2}$ divisions more, and we shall be at the starting point again. Thus, with an index-reckoning number $39\frac{1}{2}$, or $\frac{79}{2}$, we can divide into 79 parts either with one turn and twice around, or with $\frac{1}{2}$ turn and once around.

With the same gearing, $\frac{1}{2}$ turn of the plate to 1 turn of the spindle, and the plate rotating in the opposite direction to the crank, we add the $\frac{1}{2}$ turn of the plate to the 40 turns of the crank and have $40\frac{1}{2}$ or $\frac{81}{2}$ as the index-reckoning number. Setting the sector for $\frac{1}{2}$ turn, we have $\frac{81}{2} \div \frac{1}{2} = 81$ divisions. Setting the sector for $\frac{1}{6}$ turn, we have $\frac{81}{2} \div \frac{1}{6} = 243$.

Instead of saying, "the number of turns of the index-crank to 1 turn of the spindle," we can say "the regular spacing number." In the following calculations, the regular spacing number is 40, as heretofore.

Now that we understand how to figure different divisions after assuming the turns of the index-plate to 1 turn of the spindle, we can the more easily understand how to figure the required turns of the index-plate in order to arrange the machine for a given number of divisions. Since the quotient of the index-reckoning number divided by the turns of the crank at each indexing in relation to the index-plate is equal to the number of divisions, it follows that the product of any required number of divisions multiplied by any assumed number of turns of the crank at each indexing in relation to the index-plate is equal to an index-reckoning num-

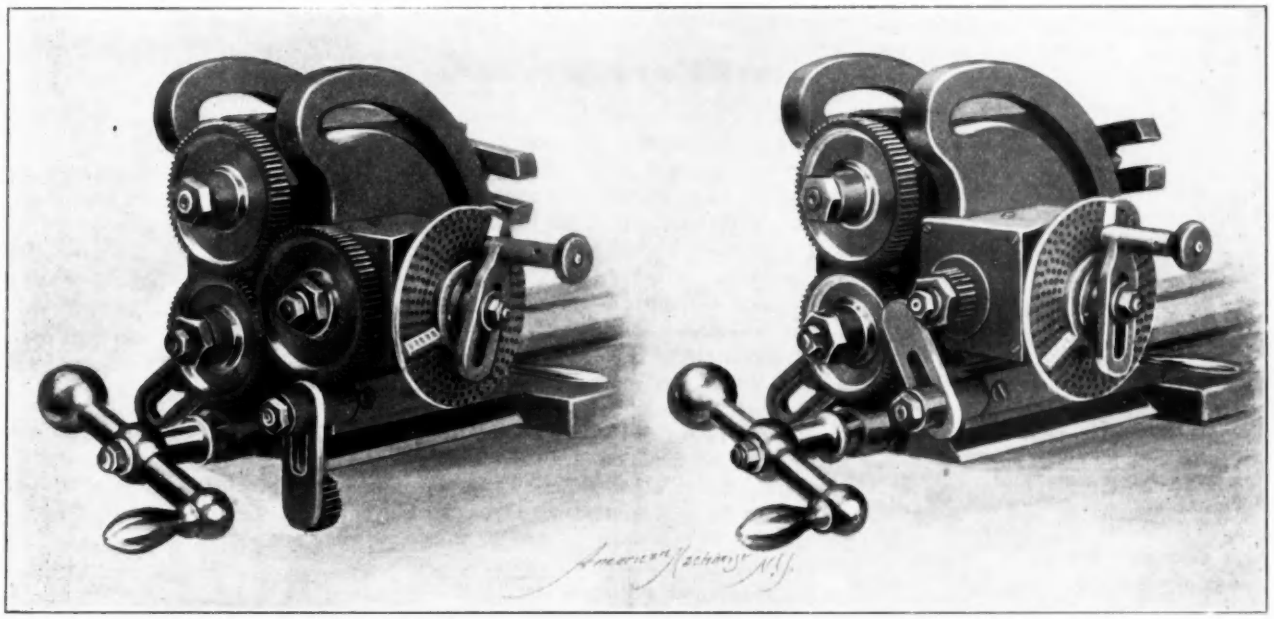


FIG. 1. FIG. 2.

DIVIDING HEAD SET UP WITH INDEX PLATE AND SPINDLE GEARED TOGETHER.

ber. We now find the difference between the index-reckoning number and the regular spacing number, which in our case is 40, and this difference is the number of turns of the index-plate to 1 turn of the spindle. If the index-reckoning number is less than 40, one idler is needed, as in Fig. 1, which rotates the plate in the same direction as the crank. If the index-reckoning number is larger than 40, two idlers are needed, as in Fig. 2.

Example: How shall we arrange for 67 divisions? We assume some number of turns of the crank that will divide not far from 67 with the index-plate anchored. Let us try $\frac{4}{7}$ or $\frac{28}{49}$ turns of the crank, which is the indexing for 70 divisions. Multiplying these turns by the number of divisions, we have $\frac{4 \times 67}{7} = \frac{268}{7}$, or $38\frac{2}{7}$ as the index-reckoning number. $38\frac{2}{7}$ subtracted from 40 leaves $1\frac{5}{7}$, which is the number of turns of the index-plate to 1 turn of the spindle. These turns can be made with a 48-tooth gear at the spindle and a 28 at the index-plate. Only one idler is needed.

It will be remembered that with two idlers we add the gearing ratio to 40. $\frac{15}{7} = 1\frac{8}{7}$, which, added to 40, gives us $41\frac{8}{7}$, as another index-reckoning number. We assumed a sector setting for 70 divisions when the plate is anchored, and we geared the plate so as to subtract 3 divisions from 70, leaving us the required 67. With two idlers in action the gearing adds 3 to the 70, making 73. Thus, the index-reckoning number $41\frac{8}{7} = \frac{295}{7}$. Dividing $\frac{295}{7}$ by the turns of the crank, we have $\frac{295}{7} \div \frac{4}{7} = \frac{292 \times 7}{7 \times 4} = 73$.

In the Brown & Sharpe Manufacturing Company's works, a milling machine was arranged according to Mr. Pilton's figures to cut 59 teeth. The sector was set for $\frac{2}{3}$ turns of the crank, which is the indexing for 60 spaces, and the index-plate was geared to rotate 1 turn to 1 turn of the spindle. One idler was in action as shown in Fig. 1, which rotated the plate in the same direction as the index-crank. After cutting 58 teeth, the next cut split the first tooth in two. Several men were called to check the work and they were forced to the conclusion that the usually accurate "American Machinist" had made a mistake. Finally, one of the men suggested that it was one of the indexings that must be either dropped or added, and not one turn of the index-crank.

This suggestion is the key to figure for spacing by the new method. After putting a 72-tooth gear at the index-plate and a 48 at the spindle, with one idler as in Fig. 1, the required 59 teeth were cut. This is at once seen by figuring, as has been shown. Assuming $\frac{2}{3}$ of a turn of the crank, which is the regular indexing for 60 spaces, we have $\frac{2}{3} \times 59 = \frac{118}{3} = 39\frac{1}{3}$ as the index-reckoning number. The difference between $39\frac{1}{3}$ and 40 is $\frac{2}{3}$, which is the number of turns of the index-plate to 1 turn of the spindle. With two idlers in action 61 teeth were cut.

It may be interesting to know what Mr. Pilton's arrangement really does space. The plate being geared to the spindle 1 to 1, we have either 39 or 41 as the index-reckoning number; with 39, we have $39 \div \frac{2}{3} = \frac{117}{2}$, or $58\frac{1}{2}$ spaces. By going twice around, 117 spaces were cut. With $\frac{1}{3}$ turn, the 117 spaces were cut, going once around.

With 41 as the index-reckoning number and $\frac{2}{3}$ turn of the crank, we have $61\frac{1}{2}$ spaces the first time around and 123 spaces the second time around.

The arrangement suggested by the editor for 175 teeth was tried. The plate was geared to rotate $\frac{1}{2}$ turn to 1 turn of the spindle, one idler being in action; the sector was set to indicate $\frac{5}{11}$, which is the indexing for 88 spaces. The index-reckoning number was thus $39\frac{1}{2}$ or $\frac{79}{2}$. Dividing by $\frac{5}{11}$ we have $\frac{79}{2} \div \frac{5}{11} = \frac{79 \times 11}{2 \times 5} = \frac{869}{10}$. This gave 86.9 spaces the first time around, 173.8 the second, and in ten times around there 869 teeth by actual count.

One hundred and seventy-five divisions can be spaced by placing a 40-tooth at the spindle, a 24-tooth gear at the index-plate, and with a sector setting for $\frac{3}{21}$ turns of the crank.

The new method is remarkable, in that with the simple addition of an arbor or a special center, an ordinary universal milling machine is rendered available for an extended range of divisions. It is much simpler to figure and easier to use than the compound indexing methods heretofore published. When a machine is adjusted by the new method, no extra care is required in indexing. It may have its limitations—perhaps it is not available for spiral gears—but at this writing I think there is no safety in attempting to determine its scope. A few weeks ago, I should have been loath to believe that an arbor is all that is required to render a milling machine available for cutting 361 teeth. To-day, I am expecting more surprises.

[At this rate we shall soon be comforted for having made that mistake. Had we seen the fallacy in Mr. Pilton's article we should have sent it back and the possibilities of the method might have remained undiscovered. Sometimes there is victory in defeat, and some mistakes certainly have their compensations.—Ed.]

Measuring the Pitch of Screw Propellers.

BY ALBERT E. GUY.

In the "American Machinist" No. 6, 1901, "G. S." gives a method for measuring the pitch of screw propellers, which is very difficult of execution. It consists in finding—by means of a known angle coinciding on one side with a portion of a helix on the working face of the blade, and on the other with a plane perpendicular to the axis of the propeller—the radius of the arc of circle which is the projection of the helix upon that plane. This radius is the generatrix of the helix; by multiplying it by a coefficient dependent on the angle employed the pitch is obtained.

While theoretically this process is entirely correct for *a true pitch blade*, it is difficult to see how the triangle made of thin wood, which is used for measuring the angle, can be bent in advance in the shape of an arc of circle whose unknown radius it is required to find. If the curvature and position of the triangle must be obtained by repeated trials, the chances of error are then so great that they deprive the method of all its value.

An objection can also be made to the use of the given coefficients corresponding respectively to angles of 60, 45 and 30 degrees, which, although correct, are of unknown origin, and, if once forgotten, would render the method useless. Besides, it is preferable to know the principle upon which this latter is founded, than only the numericals corresponding to one or more applications of it; for such knowledge would enable one to use angles which might be found more convenient than those stated above.

The origin of the numericals quoted is given herewith:

Fig. 1 represents a triangle having for base $A\,B$, the length of a circumference of radius R, while the hight $B\,C$ is the pitch —supposed constant—of the propeller.

The angle $a = B\,A\,C$ being known, we have the relation:

$$A\,B \text{ tang. } a = B\,C, \qquad (1)$$

or $$2\,\pi\,R \text{ tang. } a = \text{pitch.}$$

If a is made successively 60, 45 and 30 degrees, these angles will correspond to arcs of circles whose radii will be respectively R, R_1, R_2. Consequently we have:

$$\left.\begin{aligned} 2\,\pi\,R \text{ tang. } 60^\circ &= 2 \times 3.1416 \times 1.732 &&= 10.8828\,R \\ 2\,\pi\,R_1 \text{ tang. } 45^\circ &= 2 \times 3.1416 \times 1 &&= 6.2832\,R_1 \\ 2\,\pi\,R_2 \text{ tang. } 30^\circ &= 2 \times 3.1416 \times 0.57735 &&= 3.6276\,R_2 \end{aligned}\right\} = \text{Pitch}$$

It is thus seen that formula (1) is all that is necessary to remember in order to make use of the process, and that any convenient angle a can be employed, its tangent being readily found in any handbook. It is hardly necessary to say that if the radius is expressed in inches, the pitch will be in inches.

The other method, which was published in issue No. 25 of last year, and to which "G. S." refers, is also very interesting, simple and absolutely correct for a true pitch blade. The only fault which might be found with it—and that fault would be due to inaccuracy on the part of the operator—is that the diameter of the circle drawn on the hub of the wheel and the

length of the twelfth part of the circumference used as a base might not be exact, principally so in the case of a large propeller.

Among the many different ways used for measuring the pitch of a propeller, the two given in the following are entirely correct and very easy to apply.

Fig. 2 represents one blade of a propeller projected upon a plane perpendicular to the axis O; in other words, it is the plan view of the blade. Fig. 3 is the end view of the same blade showing in section the projection of the portion of a helix passing through the points A and B. It is very important to remark that this projection is not the development of the helix.

Now, in Fig. 4 we have a triangle $A\,B\,C$ whose base $A\,C$ is divided into equal parts at H by the axis $O\,O$ of a cylinder $M\,N\,L\,K$; the base and the axis are at right angle. Furthermore, the length of the base is equal to the circumference $2\,\pi\,R$ of the cylinder. Consequently, if we wrap the triangle, which we can imagine to be made of paper, around the cylinder, the hypothenuse produces the figure $D\,E\,F\,G\,H$, which is a helix. The hight $B\,C = D\,H$ is the pitch of the helix, and the projection of this latter, as seen in Fig. 5, is nothing else but the circumference of the cylinder. The angle $B\,A\,C$ measures the inclination which the hypothenuse $A\,B$, tangent to the helix at point B, makes with the horizontal $A\,C$. If this angle is known as well as the radius of the cylinder, the pitch is given by the formula:

$$\text{Pitch} = 2\,\pi\,\text{R} \times \text{tangent}\ B\,A\,C. \quad (1)$$

If perpendicularly to axis $O\,O$ we draw a line intersecting the circumference at A_1 and B_1, Fig. 5, and project these points, in Fig. 4, on the helix, the portion $A_1\,F\,B_1$ will represent the face of the blade as seen in the section in Fig. 3. It is clear that a straight line passing through $B_1\,A_1$ and cutting $A\,C$ at A_2 does not represent the tangent to the helix, for the angle $A_1\,A_2\,C$ is greater than $B\,A\,C$. The lateral projection of point D is at B, and that of H is at A, and the line $A\,B$ is the length of the helix whose vertical projection is a circumference equal to $2\,\pi\,R$; in the same manner, the lateral projections of points A_1 and B_1 are respectively A_2 and B_2, and the straight line $A_2\,F\,B_2$ is the development of the portion of the helix whose vertical projection is arc $A_1\,S\,B_1$.

Consequently, knowing the radius R, the vertical distance P_1 and the horizontal distance V between A_1 and B_1, we have all the elements necessary for determining the pitch of the helix. The distance V is the chord of the arc $A_1\,S\,B_1$, whose length we must find. From the equation:

$$R \sin. \frac{A_1\,O\,B_1}{2} = \frac{A_1\,B_1}{2} = \frac{V}{2} \quad (2)$$

we have

$$\sin. \frac{A_1\,O\,B_1}{2} = \frac{V}{2\,R},$$

which gives us the value of angle $A_1\,O\,B_1$; then from this relation:

$$\frac{\text{arc}\ A_1\,S\,B_1}{2\,\pi\,R} = \frac{\text{angle}\ A_1\,O\,B_1}{360}$$

we get: Length of arc $A_1\,S\,B_1 =$

$$\frac{\text{angle}\ A_1\,O\,B_1 \times 2\,\pi\,R}{360} \quad (3)$$

Angle $A_1\,O\,B_1$ is here expressed in degrees, as easily found in tables of trigonometric functions.

But since $A_2\,F\,B_2$ coincides with line $A\,B$, its angle of inclination is $B\,A\,C$, and we have:

$$\frac{B\,C}{P_1} = \frac{2\,\pi\,R}{\text{arc}\ A_1\,S\,B_1}$$

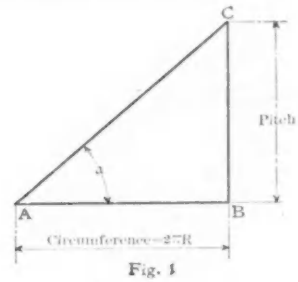


Fig. 1

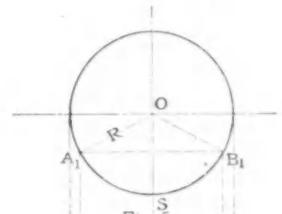


Fig. 5

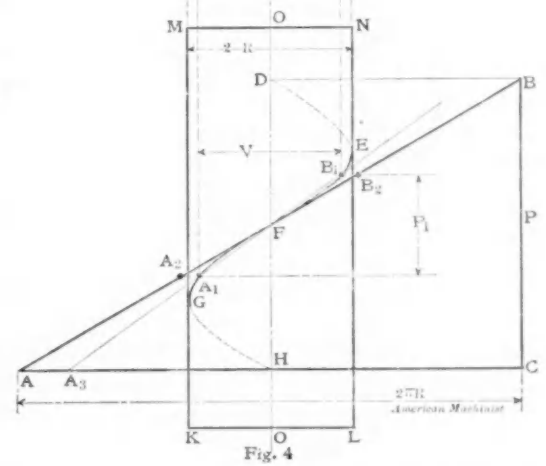


Fig. 4

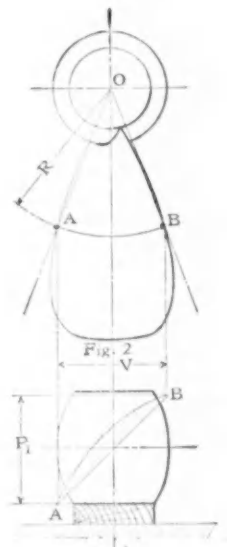


Fig. 3

MEASURING THE PITCH OF SCREW PROPELLERS.

But $B\,C$ is the pitch of the helix, hence

$$\text{Pitch} = \frac{2\,\pi\,R \times P_1}{\text{arc}\ A_1\,S\,B_1} \quad (4)$$

If in equation (4) we replace the arc by its value as per equation (3), then: Pitch $=$

$$\frac{2\,\pi\,R \times P_1 \times 360}{\text{angle}\ A_1\,O\,B_1 \times 2\,\pi\,R} = \frac{P_1 \times 360}{\text{angle}\ A_1\,O\,B_1} \quad (5)$$

Of the two methods advanced here, the first one can be executed as follows: From the center O of a propeller, and with any convenient radius R, mark on the edges of the blade two points A_1 and B_1. As the wheel to be measured is generally placed horizontally, it is easy to level it, and then the points A_1 and B_1 can be marked by means of plumb-line attached to a straight-edge, which may be applied diametrically against the face of the hub, the distance R being conveniently determined on the straight-edge. The horizontal and vertical distances V and P_1 respectively, between A_1 and B_1, are then measured in the ordinary way—by means of one square and one rule—and knowing the three quantities, R, V and P_1, the pitch is found by using the formulas (2) and (5). If the lengths have been expressed in inches, the pitch will be in inches. By modifying formula (5) we obtain:

$$\text{Pitch, in feet} = \frac{30 \times P_1\ (\text{in inches})}{\text{angle}\ A_1\,O\,B_1} \quad (6)$$

The second method is simpler, but it requires the use of a protractor. The simplicity consists in requiring no book of tables, in neglecting the length of the radius in the calculations, and in solving only one equation. Effectively by employing two straight-edges for marking the points A_1 and B_1 with the same radius of indifferent length, and measuring by means of a bevel the angle $A_1\,O\,B_1$, it suffices to introduce the value in degrees of the latter, and that of P_1—which is always easily determined—in equation (5) or (6) to obtain the pitch.

When the wheel is keyed to the shaft on the boat, the process is a little more laborious, but the result is not affected. When the pitch of the propeller is variable it is necessary to use carefully-made templets, to develop them on a board of suitable size, and to proceed in the same manner as in making the original drawing of the wheel, which, of course, requires much work.

Responsibility of the Employer for Negligence of Foremen.

For several years it fell to my lot to erect machinery, in various parts of the country, with the assistance of help of all degrees of helpfulness. Perhaps the most trying of these experiences arose where the help must of necessity be directed through an interpreter, and this contingency has happened more than once in these United States. Possibilities for accident are the more numerous under this indirect direction of affairs, and I take some pleasure from the fact that, during this occupation, no injury happened to anyone, with one exception.

My assistants were in the employ of the corporations to whom I was temporarily assigned, and they had the aforesaid interpreter as a foreman. Occasionally I pondered how this relationship of labor would affect any of us in case of an accident. It is not a very obvious matter to a layman, and on looking up the problem to some little extent, I find that this question of the difference between being simply a fellow servant and one having authority to direct and control as an employer is not always answered alike by the higher authorities, even under the same circumstances and conditions. The very definitions are not apparently established, and in some States statutory enactment has been made to settle the difference of opinion as to what is, or is not, a fellow servant.

As I understand the common law, an employer is liable in damages if by his negligence an employee is injured; negligence being the doing of something which a prudent man would not do, or the omission of any precaution which a careful man would have taken. Now the employer can, and frequently does, empower some employee to act for him as foreman or superintendent. If this substitute is fully representative he becomes a vice-principal, and the employer is responsible for his neglect also. The whole thing turns upon the degree in which the foreman "acts for" the employer as well as the matter of being a co-employee.

In a case brought before the Supreme Court of Georgia on appeal, the Chief Justice states that: "A workman engaged on the same job with others, and having direction of it, is not a vice-principal of the master, but stands on the footing of a mere fellow servant." (30 S. W. Reporter, page 884.) And all risk arising from the negligence of a fellow employee is assumed by the others and is therefore no cause for an action against the employer. A somewhat similar case is given in the Federal Reporter 88, page 773; namely, the death of an employee by the falling of a bridge on which he was working. It was alleged that the accident was caused by the negligence of one W. S. Hanna, who, as manager, failed to take precautions to avoid accidents. The United States Circuit Court found a verdict for the defendant railroad company on the ground that the foreman was a co-worker and not a vice-principal, as may be seen by the following brief extract from the lengthy opinion: "Hanna was an employee of the receivers of this railroad, a foreman engaged at manual labor in a special class of work along with other workmen. He was depended upon to take charge on the spot in person of every job of bridge building or repairing that was required on a long section of the railroad. But he did this in detail. He had no stationary headquarters. His service was not limited to giving orders from a central point to workmen at a distance, but he was personally present in executing each job, laboring with his own hands as a mechanic along with the rest of his gang in its execution. He was so actually engaged when the accident under present consideration happened, and therefore I am of opinion that he was a co-employee of Yager (the decedent) in every particular and every sense." The point does not seem to me any too obvious and one wonders what the learned judge would have thought of the workman's status if the latter had *not* attended to details. The matter is too serious for a joke, but the evident connection between a lack of details and a stationary headquarters is worth noting.

The status of a foreman and a journeyman is analogous to that of a conductor and a brakeman; the latter case has come before the Supreme Court of the United States, and this point has been argued on both sides by eminent judges of that body. (20 S. C. Reporter, page 85.) An action had originally been brought by a brakeman, Conroy, against the New England Railroad Company, on account of the negligence of the conductor of a train; and the opinion of the court was delivered by Mr. Justice Shiras, December 4, 1899: "There is a general rule of law . . . that one who enters the service of another takes upon himself the ordinary risks of the negligent acts of his fellow servants in the course of his employment. But there have been conflicting views expressed in the application of this rule in cases where the employer is a railroad company or other large organization employing a number of servants engaged in distinct and separate departments of service; and our present inquiry is whether the relation between the conductor and the brakeman of a freight train is that of fellow servants, within the rule, or whether the conductor is to be deemed a vice-principal, representing the railroad company in such a sense that his negligence is that of the company, the common employer. . . . We have no hesitation in holding, both upon principle and authority, that the employer is not liable for an injury to one employee occasioned by the negligence of another engaged in the same general undertaking; that it is not necessary that the servants should be engaged in the same occupation or particular work; that it is enough to bring the case within the general rule of exemption if they are in the employment of the same master, engaged in the same common enterprise, both employed to perform duties tending to accomplish the same general purposes, or, in other words, if the services of each in his particular sphere or department are directed to the accomplishment of the same general end; and that, accordingly, in the present case, upon the facts stated, the conductor and the injured brakeman are to be considered fellow servants within the rule. . . . Without following further the history of this subject in the courts of the several States, we may state that, generally, the doctrine there upheld is that of the cases herein previously cited, except in the courts of Ohio, Kentucky, and perhaps others, in which the rule seems to obtain that while the master is not liable to his servant for any injury committed by a servant of equal degree in the same sphere of employment, unless some negligence is fixed on the master personally, yet that he is liable for the gross negligence of a servant superior in rank to the person injured, and is also liable for the ordinary negligence of a servant not engaged in the same department of service."

Mr. Justice Harlan could not agree with this opinion, and delivered his dissenting views thus: "In my judgment the conductor of a railroad train is the representative of the company, in respect to its management; all the other employees on the train are his subordinates in matters involved in such management, and for injury received by any one of these subordinates during the management of the train by reason of the negligence of the conductor, the railroad company should be held responsible. As the conductor commands the movements of the train, and has general control over the employees connected with its operation, the company represented by him ought to be held responsible for his negligence resulting in injury to other employees discharging their duties under his immediate orders. If in such case the conductor be not a vice-principal, it is difficult to say who among the officers or agents of a corporation sued by any one of its employees for personal injuries ought to be regarded as belonging to that class."

A similar case was decided by the Court of Civil Appeals of the State of Texas,

November 29, 1899 (54 Southeastern Reporter, page 263). Judge Neill, in delivering the opinion of the court, expresses the following:

"But apart from the question of orders, the indisputable evidence shows that a vice-principal of the plaintiff caused the accident. Robinett was the brakeman, having no control over the train, and knowing nothing about the orders which controlled it. The conductor had absolute control over him, and ordered the train out. It would make no difference, so far as Robinett was concerned, whether the collision was brought about by improper orders from the superintendent or by the negligence of those in immediate charge of the trains. None of these parties were his fellow servants; and the company was liable to him for the negligence of any or all of them."

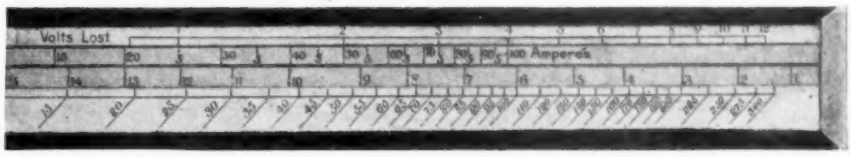
Attention has already been called to the fact that in various States statutes have been enacted which modify more or less the employer's liability, particularly with regard to the negligence of fellow servants; these laws are briefly mentioned in an interesting article by Mr. Fessenden in one of the Bulletins of the Department of Labor, and can, I dare say, be obtained for the asking.

The injuries sustained by workmen belong to a very unpleasant category; an employer ought not to bear the blame of the careless or even the awkward; and on the other hand undoubtedly the workman is often tempted to take obvious hazards to advance the interest of his employer and himself; and the temptation is all the stronger when it is encouraged by one "dressed in a little brief authority." It is just as well to consider that in such cases discretion is the better part of valor, and that, moreover, the employer may not be legally responsible for the consequences. And this last possibility is not nearly so well known as it should be. There is sufficient to show in the cases quoted how much at variance the several legal authorities stand with regard to the matter; the point of view of the respective judges is doubtless affected by procedure and statutes peculiar to that particular State. As a legal problem involving every workman, it is decidedly worth while to suggest how these decisions lack uniformity. "Q."

Slide Rule for Electrical Calculations.

The accompanying illustration shows a new special slide rule for the determination of the sizes of electrical conductors without calculation. The upper scale of the body gives the loss in volts, which is naturally assumed at the start. Against the selected loss is placed the volume of the current in amperes, which appears on the upper scale of the slide, and above the length of the wire on the lower slide of the body will be found the proper size of copper wire by the Brown & Sharpe wire gage. Thus, as set, the instrument shows that a current of 50 amperes flowing through a No. 6 wire 100 feet long would suffer a loss of voltage of 2 volts, while for the same current and the same loss the wire of 200 feet long would need to be of No. 3 size.

The actual instrument is about 12 inches long. We have shown but a portion of it, in order to have the figures and divisions show clearly.



SLIDE RULE FOR ELECTRICAL CALCULATIONS.

The instrument is made by A. E. Colgate, of 56 Pine street, New York.

Operating Gas and Gasoline Engines—I.

BY HARRY J. PERKINS.

I have here put together various items of information and some advice concerning gas and gasoline engines which have already proved of service to some sellers, buyers and users. Gas engines as built to-day are simple in construction and operation as compared with the steam engine and its boiler. They are as desirable—if not more so—as any other power-developing apparatus where the power required is not large. Like everything else, these engines should be thoroughly understood by those who would use them most satisfactorily. It is not necessary to describe to the readers of the "American Machinist" the succession of events in the operation of either the two-cycle or the four-cycle engine. The four-cycle engine possesses several practical advantages over the two-cycle machine. There is a more economical use of the fuel in the four-cycle engine. For the development of any given amount of power, however, it must be built larger than the other, with heavier flywheels and better governing arrangements to secure steady running; but when all right it is less liable to get out of order and should cost less for repairs. Four-cycle engines, horizontal or vertical, are used for shop or factory driving, while a two-cycle vertical is used altogether for marine purposes, because it is lighter and occupies less space. There are special designs of vertical four-cycle gasoline engines with two or four cylinders which are regarded with favor for marine purposes. A gasoline engine will develop more power than a gas engine of the same size. Again, more power will be realized when an electric igniter is used than with an igniting tube.

Gasoline is supplied to the engine in one of two ways—by employing a pump to raise the gasoline from a tank placed outside of the building and beneath the surface of the ground, or with a tank also at some distance from the building and above the level of the engine, the gasoline feeding to the engine by gravity. The pipe used to connect the reservoir to the engine should be of iron of sufficient size so that it will not clog up easily. Gasoline should always be strained before putting it in the reservoir; much of the trouble experienced with gasoline engines results from the neglect of this.

The gas bag for gas engines should be of sufficient size so that when drawn upon there will be but a slight visible effect. It should be placed as near the engine as possible and still be out of the reach of the oil, as this rapidly ruins the rubber.

Special high fire-test cylinder oil made purposely for gas and gasoline engines must always be used for lubricating; other oils will soon shut down an engine or cause its ruin.

The exhaust pipe should never be turned into an ordinary brick or terra cotta flue. It should be carried in the pipe throughout to the open air. If a tube igniter is used, the nickel alloy specially made for gas engines is superior to anything else and will last with constant use about two years. Porcelain is next, and is good for a year or more, while gas-pipe will last only from one to four weeks.

In the selection of a gas engine, particular attention should be paid to the class of work it is to be used for. Engines built especially for driving machine shops or factories would not give satisfactory service for an electric-light plant, as a heavier fly-wheel and a more sensitive governor are required. Nor would it be advisable to select a vertical engine to place on the top floor of any building, where the foundation cannot be made substantial, as the continuous pounding of a vertical engine acts like a pile-driver and will in time cause the building to settle or loosen at the joists at that particular point.

In gas engines most of the trouble lies in the sparking device or igniter, batteries and generator. These parts should be thoroughly understood. There is one mistake made by most manufacturers of gas engines to-day. As the gas engine is still in its infancy, instruction should be given personally and a license should be issued the same as for the steam engines. A week or two weeks would be sufficient for instruction. The effect would be fewer balky and troublesome engines, a superior reputation, and a big increase in demand. Still there are thousands of them being

run successfully, and with but little trouble, if any, after the first few weeks.

LOCATION AND SETTING UP.

A gas engine should be set in the best available space, free from the annoyance of slight vibration or sound, with particular reference also to freedom from dampness and dust. It is preferable to locate an engine in a separate, well-lighted room, with space around, so that easy access can be had to all the parts.

If the engine is to be placed on the ground, the foundation pit must be dug of the solid earth, and if on the floor of a building, it is preferable to place it in the corner, and to have it well braced to avoid the springing of the joists or settling of the building at that point. There should be under every engine an oil curb to prevent the overflow of lubricating oil from damaging the cement or foundation.

STARTING.

In starting gas engines, the flywheels have to be turned over by hand until the oxplosion occurs, and if everything is all right this will be on the first revolution. Sometimes many turns are required, and on large size engines self-starters are usually furnished.

Before starting a gas engine, a regular order of procedure should be followed out. First, fill and adjust all oil and grease cups carefully and oil all moving parts. See that the igniter is in working order. If electric, test the spark by removing one wire from the binding post, holding the two electrodes together and snapping the end of the free wire across any portion of the engine. The wire should then give off a good spark; but if you separate the two electrodes there should be no spark anywhere. If there is, you have a leak, which must be attended to at once. If a tube igniter is used, bring the tube to a cherry red, usually the proper temperature. Turn on the gasoline or open the gas valve to the proper point, relieve the compression by the relief valve, turn the flywheel over by hand; or, if a large engine, put in operation the self-starter. If all goes well, it will start and run after the first revolution. After the engine is running at its full speed, turn back the relief valve, so that the engine will have full power, and see that the overflow water is at or nearly at the boiling point. The engine should never be started with a full load.

Some days the engine will require more gas or gasoline, while other days it may not require as much. This is due to the changes in the density and humidity of the atmosphere. Experience will teach at what point to turn on the gas or gasoline, and at what point it will run the best. When an engine is once started and things are set properly, the engine requires no further attention.

In stopping, turn off the gas or gasoline, water and oil. If it is desired to save time

Fig. 1

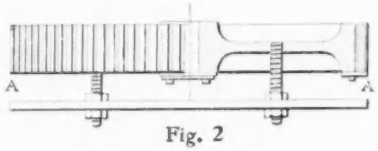


Fig. 2

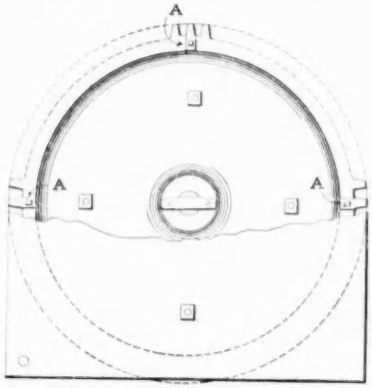
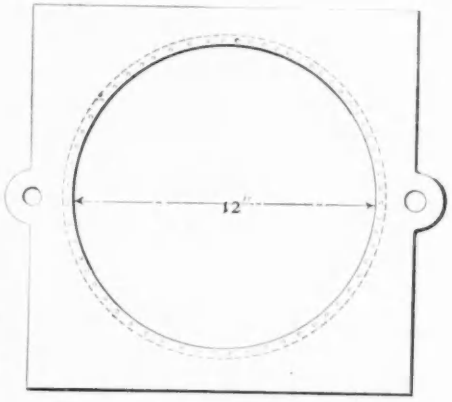


Fig. 3



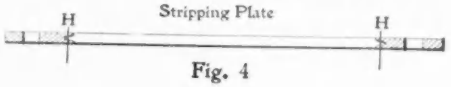


Fig. 4

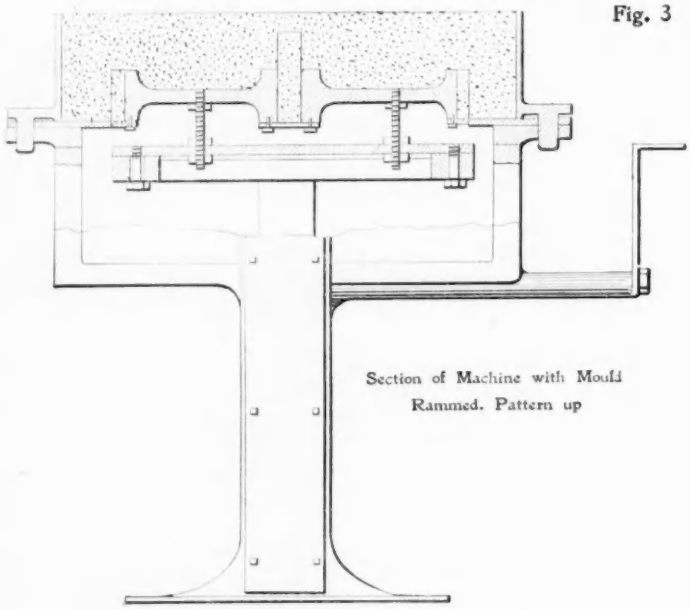

Section of Machine with Mould Rammed. Pattern up

Fig. 5

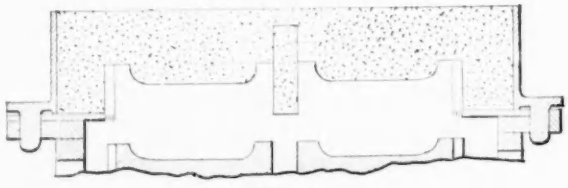


Fig. 6

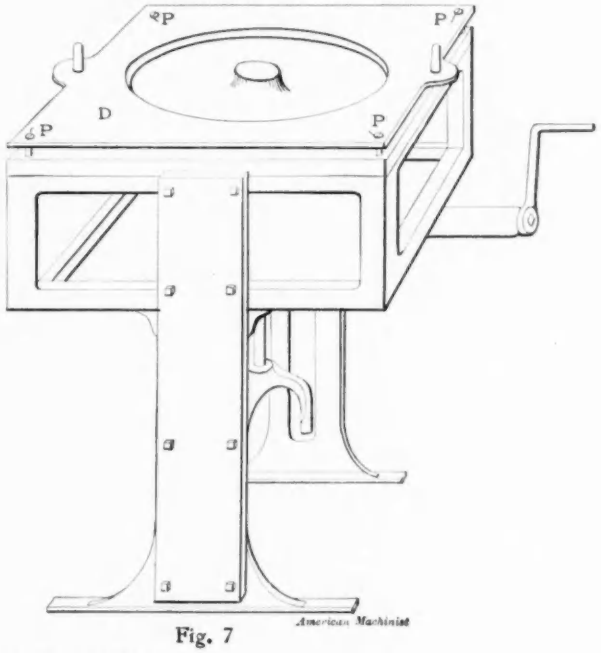


Fig. 7

MOUNTING PATTERNS FOR MACHINE MOLDING.

in stopping, brake the flywheel; disconnect one wire if there is no switch. In cold weather the water should be drained from the cylinder.

Machine Molding.

BY GEORGE BUCHANAN.

MOUNTING PATTERNS.

Mounting patterns on a stripping plate machine is at the best a tedious and often an expensive operation. The preparation of the pattern, consisting of backing it with ⅜ inch to form a guide to locate the pattern by in the stripping plate; the making of the stripping plate itself, and, in many cases, necessary stools for securing a clean lift, are some of the numerous points we have to contend with.

The use of the stripping plate machine in jobbing foundries, where orders come in for from one hundred upwards of the same pattern, and where the patterns supplied have to be worked, forms the subject of the present article; taking, for example, a gear, Fig. 1, which is a casting made in many foundries, mounting it on the machine, making one hundred or more castings, and leaving a larger profit than when made by hand—including, of course, the initial cost of fixing the pattern. To do this, various methods have to be employed which would not work well where thousands were required instead of tens.

Figs. 2 and 3 are views of the pattern and plate. Instead of backing ⅜ inch completely around the gear, four pieces, each the size of a single tooth and ⅜ inch thick, are fastened on and filed level to the face of the tooth, as *A* in Figs. 2 and 3. Four studs secure the wheel to the plate and adjust it to the exact hight required from the stripping plate. The size of the gear shown is 11 inches diameter and 1½ inches deep, and the machine on which it is mounted is 13x13 inches. For this machine we have six pairs of stripping plates, faced true and all drilled to template, with circular holes. The largest hole is 12 inches diameter, decreasing by 1 inch down to 6 inches. Fig. 4 shows a stripping plate with a groove cast in; ⅜-inch holes are drilled close to the edge of the opening into the groove. We find this arrangement works well in securing the babbitt, and when the order in hand is completed the babbitt is easily melted out.

In preparing the stripping plate it is placed face down on a level sand bed, and the gear is set into the opening in the plate and also on to the bed. Both plate and pattern having been previously warmed, the babbitt is run around into the small opening that remains. When the metal has set, the wheel is rapped out of the plate, which is then eased so that the gear works easily through the opening. We find that, with constant practice, if care is taken, very little dressing is required on the stripping plate. It is a good plan to warm the wheel and give the teeth a coat of blackwash, which about makes up for the contraction.

The pattern and plate are fixed on the machine as in Fig. 5, which shows a mold rammed ready for dropping the lever. In Fig. 6 the lever is dropped, and the pattern drawn.

The top part of the wheel is formed by lowering the lever in the machine until the top face of the wheel is level with the stripping plate. The lever is held in this position while a mold is rammed up. This is placed on the floor and a stripping plate similar to the first one described is placed on the mold. The pins in the flask and the holes in the plate make it impossible for one part of the wheel to get out of truth with the other. The stripping plate is banked up ½ inch clear of the circular opening, and the white metal is poured in to leave about ½ inch of thickness on the face of the wheel. This is really a plate, as shown in Fig. 7, *D* being the plate, which is held up in the machine by being packed off the ram ¾ inch clear of the outside frame of the machine. The four screws, with countersunk heads level with the face of the plate *P*, act as supports for the flask. The sketch is shown with the lever and plate in the right position for a mold to be rammed.

When the top is rammed, the lever is dropped, which causes the plate *D* to sink down on the frame of the machine, the flask edge resting on the heads of the four screws *P*.

Referring to Fig. 5, the method of setting the core is simple and quick, and leaves the core in the exact center of the gear. The core is made 1½ inches longer than the depth of the mold, and is placed in the bored hole in the pattern and stopped by the strip of metal across the bottom face of the boss, as shown in Fig. 2; the sand is thrown in, and the mold is rammed. The rammed sand grips the end of the core, so that when the lever is turned and the mold is placed on the floor, the core is found to be perfectly set.

Wrexham, North Wales.

Letters from Practical Men

The Open Shop Door.

Editor American Machinist:

There is one poor fellow who seems to be in a peck of trouble just now, with little prospect of any immediate relief. He's an editor or an editorial writer for one of the papers that style themselves technical—it will be an act of charity and forbearance to conceal as far as possible his identity—and his trouble is about the exposed condition of the interiors of our shops and factories. These places are crowded, you know, with all sorts of trade secrets upon which our success as manufacturers depends, and these secrets are not properly guarded. In fact, they are not guarded at all, and our foreign competitors are flocking over here and walking through our shops and getting all our ideas, and they will be going back and will be reproducing our machines and imitating our ways, and it will not be long, if these things go on, before our friends across the water will know all that we know and will be able to do everything that we do as well and as cheaply as we do it all ourselves, and then goodby to all our fondly cherished visions of industrial supremacy.

There is of course something in all this. It is a fact that our whining acquaintance has discovered, although he has been slow in finding it out. We do not police our shops, and we save the cost of the police machinery that would be required. This saving is perhaps offset by the time that is given to the guidance and entertainment and enlightenment of the visitors who come to our works. Our custom is not, perhaps, a matter of deliberate policy so much as it is a continuance of a habit of mutual helpfulness and communicativeness that begins with the apprentices and workmen. I personally have known the inside of the shop, and have known the ways of the men of the shop by intimate association with them, for a full generation, and I know that they are good fellows. I have found them, with mighty rare exceptions, ready to help me, and to help anybody else, with any information they have had, and to let me see whatever they have been doing and how they were doing it. I have known fellows get along in the world and get to be shop proprietors, and they have always been the generous and openly communicative fellows, rather than those who were close, suspicious and secretive. They have not changed their habits as they have advanced, but if possible their characteristics have become more pronounced. It is really rather amusing how simple they have been, and how innocently they have gone along in their confiding ways, so that the reminder of the great danger they have been incurring has had to come to them from those who are apparently only friendly onlookers. It is not the shop proprietors themselves who are alarmed about the appropriation of their valuable ideas and practices by inquisitive foreign competitors. The warning comes to them from those who are not habituated to the ways of the American shop from away back. The poor fellows who are now so troubled about what is really out of their line, if not beyond their comprehension, are, you may be sure, of the same gang with those who are so troubled about our future supply of skilled workmen. Both are mares' nests of the first magnitude.

As I have said, there has been no deliberate planning of our way of working with our shops wide open. That has simply been our habit from the beginning, and we have not thought to change it. But if, however, we had of deliberate purpose hung our latch string out, and if we had carved in stone over every shop door, as Prof. Sweet has actually done over that of the Straight Line Engine Company, "Visitors Always Welcome," there would

have been strategic wisdom in it. If you can keep your competitor always copying your work, and always looking into your ways to imitate them, you are sure to keep him a certain distance behind you—as far behind, in fact, as it is desirable to have him. Nobody living and no nation on earth can ever get ahead of anybody by following in his footsteps. It is a toss up between the American alarmist and the alleged European imitative competitor as to which shall have the leather medal.

The question of industrial success is an intricate one, and it is never to be solved by exclusive attention to any single minute detail, such as is the one that has been here referred to. Our habits and ways, both of shop management and of individual working; our habits and customs as shop proprietors, as managers and as workmen, differ in many respects from those of any other nation. It seems evident that in some things our ways are somewhat more advantageous, but doubtless in some other respects there are other ways that are better than ours, and mutual advantage would be best promoted by opening the doors on either side that still are closed, rather than by closing any doors that are open.

Our friend, however, is fully committed to a different course. He believes that shop secrets should be jealously guarded. This means, if it means anything, that the technical, or at least his technical journal, should go out of business. It will be a traitor to American industries if its pages ever tell of anything American and shoppy that is not already known and practiced abroad. If in some unguarded moment some open-hearted American proprietor lets out to it some information concerning some successful and profitable operation of the shop, it will be its self-evident duty to suppress it. It is not easy to see what our friend has to live for as a technical journalist.

In the meantime there are other journals that will have no scruples about telling all the world what it will do all the world good to know about the latest and best tools and methods and results, wherever these things are to be got hold of, and whoever may be benefited by reading of them, and if with the American worker the Englishman and the German also get the good of it, why, they are welcome to it, and in the end it is really no loss to us.

TECUMSEH SWIFT.

Some Points in Drawing Room Practice.

Through an oversight the illustrations which should have accompanied the article by Mr. L. O. Danse, in our issue No. 8, 1901, were omitted, and we give them here. Mr. Danse has replied to our comments on his practice, and his and other letters on the same subject are given below:

Editor American Machinist:

When a chap gets a chance to come back at the editor he ought to take advantage of it, because the editor is usually right, and it is a lot more satisfactory to criticise those who don't often lay themeselves open to blame than those who are habitually wrong. So when I read your remarks on my article on drawing-room practice, I felt greatly indebted to you for affording me another excuse for "rising to remark."

You tell us that the inclined vinculum is prohibited in some offices to prevent careless draftsmen from writing mixed numbers so that they may be taken for badly written fractions. Now, that is an excellent reason, only it leaves out of consideration the fact that the careless draftsman isn't going to let such a little thing as a good rule bother him at all. If you deny him the privilege of writing $\frac{1}{16}$" thus: -1/16" he will retaliate by writing it thus: $-\frac{1}{16}$". How do I know he will? Just because he has written it that way for me just about fifteen-sixteenths of the time I had to endure his style of assistance.

I have in mind a complicated drawing I

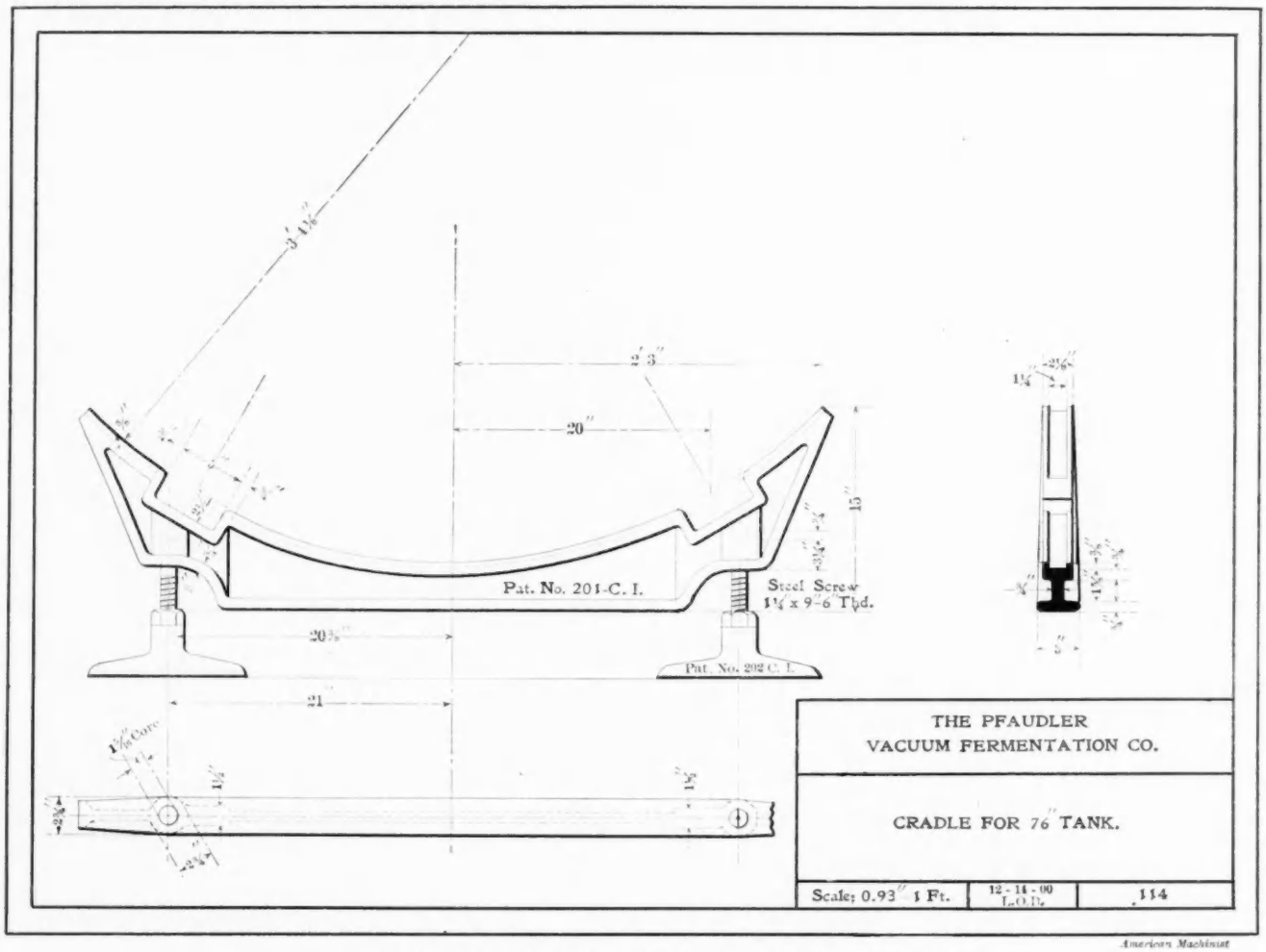


FIG. 1. SAMPLE DRAWING ARRANGEMENT, ORIGINAL SIZE 8½X11½ INCHES.

was examining yesterday, of a peculiar form of valve. With two exceptions, the fractions on this drawing are written with the vinculum horizontal; but in each of the two exceptions the fractions had to be written in a very limited space, as it was impossible to extend the carrying-out lines. The draftsman very wisely concluded that it was wiser to make good, bold figures, thus 7/8", than little bits of figures, thus 7/8"; and he kept them quite clear of the lines above and below, too.

As I said in my previous communication, these matters should be regulated by common sense rather than by hard and fast rules, and I most heartily endorse the views of Mr. Dickie, in your issue No. 7, 1901, on the necessity of educating the judgment in technical matters.

I have been told that at Bement, Miles & Company's the draftsmen are required to write the letters, ft., in., instead of using the customary ticks, because the careless omission of a tick in a bill of material once caused them to receive a carload of 2-inch shafting 15 feet long, instead of a wagonload of the same material in 15-inch lengths. Now, there is another case of the careless draftsman and another attempt to guard against him. For my part, I would prefer retaining the ticks and requiring the use of 0" after the length in feet whenever the lengths come in even feet. On bills of material I always write fractions of a foot thus 0'-7½" to avoid just such errors.

In the drawing-room of the Carnegie office, where the shop sketches for structural ironwork are prepared, there is a rule prohibiting the use of the customary dash between the feet and the inches. This rule is aimed at the careless draftsman who writes his feet and inches in such a manner that the tick of the foot-mark looks like the numerator of a fraction of an inch. In this case, again, I think it would be better to use the dash, and require dimensions less than an inch to be written thus 0 1/2", when following a number designating feet.

You wound up your foot-note with a plea in favor of putting the title in the upper left corner of the sheet, to admit of filing the sheets in deep, narrow drawers, instead of wide, shallow ones. This system is, I believe, in use in the office of the superintendent of motive power of the Baltimore & Ohio Railroad. One of its most charming characteristics is that as you look over the pile of drawings in the drawer, you find all the titles upside down, which makes them hard to read; or, if that has been guarded against by facing the title toward the top border, you have to stand on your head to read the title of a drawing which has been laid out on your desk for examination.

Now as to the economy in wall space from this arrangement, it is largely hypothetical. Some day I may tell you why I didn't say theoretical. In a well-regulated drawing-room the number of large sheets is very small (with apologies to the vaudeville Irishman), because large sheets are an abomination in the shop, where there isn't room to spread them out, either on the bench or the machine, while on the floor they are equally in the way, and the ceiling is too distant; besides, the ceiling is generally a roof. The draftsman who fills a big sheet full of miscellaneous details is a thief and a robber who is putting his hand right down into the stockholders' pockets and "touching" them for that which they should receive in dividends.

Now, in all well-regulated works the number of cards or small sheets is vastly greater than that of the large ones, and as the card tracings are filed in compartments in the large drawers, the amount of wall space occupied is about the same, whether the compartments have their longer dimension parallel or perpendicular to the wall.

I have had some experience with a case in which large sheets were filed in accordance with the system you advocate, and I hope the Lord will forgive the man who invented it, because I won't. When you pull out a tracing from the bottom of the pile, the rest come out "in echelon" after it, and you have to spend five minutes replacing them before the drawer can be closed. When you go to put a tracing in, it is much harder to handle than when worked the other way, and the tracing gets kinked, breaking the gloss and reducing its value for making nice prints.

Say, isn't it a good thing that we don't all think alike? You would run out of copy, and progress in our shops would cease. We would sink to the level of China and worship tradition and ancestry, and the Japs and Coreans would come over here and give a vaudeville in the most sacred temple of our forbidden city, while we got down on our hands and knees and prayed for peace without dismemberment.

L. O. DANSE.

[Mr. Danse cannot have understood what we said in advocacy of the upper left-hand corner as the proper place for the title. The title, as the sheets lie in the drawer, is at the left front corner. When looking for a given sheet, the draftsman stands with his right side to the drawer, and the titles are in a perfectly easy, natural position to read. They are not "upside down," nor does one have to "stand on his head" to read them wherever the sheets may lie. Regarding small sheets, the drawing office has some claims as well as the shop. The shop wants small sheets confined, so far as possible, to single details, but that is no necessary reason for burdening the office with them. The shop uses prints, while the office uses tracings. The shears are always handy, but because the prints should be cut into pieces is no reason for cutting the tracings. Our own plan when dealing with these matters was, for detail drawings, to divide the tracings by lines into halves or quarters as required. The details were drawn in the spaces so made, and the blueprints were cut on the lines, but the tracings were not cut. In the upper left-hand corner of the tracing was placed a complete title, and each section had, in addition, a brief title, sufficient for identification of the prints. This plan gives three standard sizes for the shop—or four, if the tracings be divided into eighths—with perfect facility for separate drawings for each detail. There is, however, but a single size of sheet for the drawing office. We suppose that "hypothetical" or "theoretical" objections can be found to this plan, but it worked well. We fail to see the force of the argument that a given number of wide drawers occupy no more wall space than

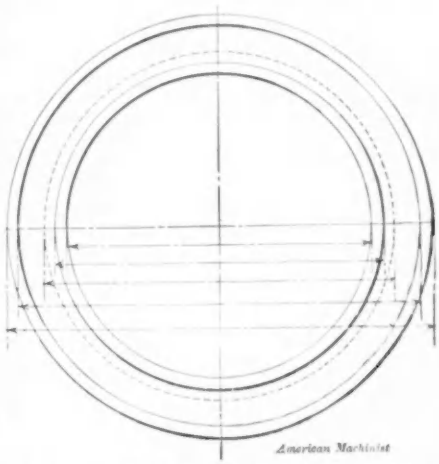


FIG. 2. DIMENSIONING A SERIES OF CONCENTRIC CIRCLES.

the same number of narrow ones. Our impression is that a 3-foot wide drawer requires one-half more space than one 2 feet wide. Nor have we found any greater difficulty in taking a tracing from a drawer or in putting it back in one shape of drawer than in the other.—Ed.]

Editor American Machinist:

I am glad to see you advocate the use of the horizontal dividing line for fractions in the editorial remarks at the close of Mr. L. O. Danse's article in issue No. 8. If a line must be used, there should be no question as to the value of the horizontal over the inclined line. But why use a line at all? It serves no useful purpose, and it does take the draftsman's time, that could with more profit to the employer as well as the draftsman be spent on other work. A point not touched upon in the above-mentioned article that is deserving of attention is in regard to the practice of putting the symbol for feet and inches after every figure on a drawing. There is no need of it, as a rule, on the general run of work where the highest dimensions do not exceed 8 feet, say. It answers every purpose, if instead of

writing 7′ 4″ on the drawing the number 88 is used—that is, if all dimensions are given in inch units instead of the foot and inch units.

Above 8 feet, the inch unit might prove cumbersome, in which case it would perhaps be better to retain the foot and inch units. Or the inch unit might be used up to 8 feet, and, above that, the foot and inch unit combined. Such a system in a shop where both large and small work is carried on might be troublesome, however, on account of the confusion that would result from the use of the two systems of units near the dividing line between them. Where all the work is below 8 feet, though, the inch unit is far superior to the combined unit.

I can't agree either with your ideas in the matter or with the general practice as to the correct location for the title of a drawing. It seems to me that the correct place for the title is in the upper right-hand corner for several reasons. First of all, that is the least desirable part of the sheet for use for drawing purposes, because, with the third-angle projection, the space is left vacant. With the title in the lower right-hand corner it occupies space that legitimately belongs to the end view of the drawing, and in the upper left-hand corner it occupies space that belongs to the plan. Cases have come to my notice where it has been necessary to use the first-angle projection (although the third angle is standard practice), in order to avoid interfering with the title with the end view. This is unfortunate, as shopmen become educated to reading drawings with the views in a certain relation to each other, and if this method is departed from it causes them annoyance and confusion. This is a small point, perhaps, but it is nevertheless an important one. I have been repeatedly called on for assistance from men in the shop who couldn't clearly read a drawing in the first angle, because they were used to the third. A fixed relation of the views is really of more importance than a fixed position for the title. With the title in the upper right-hand corner, filing presents no difficulties, as the sheets can be kept in drawers whose width equals the width of the sheet and whose depth (front to back) equals their length. Then when the drawer is opened the sheets can be turned with the right hand, as you would naturally turn the pages of a book, namely, by grasping the page at the upper right-hand corner. By so doing, the title is the first thing on the sheet that is exposed to view. DEKE.

[We have never before seen the abandonment of the foot as a unit advocated for as large dimensions as those given by "Deke." In many offices it is a rule that all dimensions below 30 inches shall be given in inches only, and we regard this as a good rule, but we doubt the advisability of extending it to include larger dimensions.—ED.]

Editor American Machinist:

Referring to the article on "Drawing Room Practice" in the "American Machinist" No. 8, I enclose a copy of the title used by the Fairbanks Scale Company for many years. There are a number of different titles, according to the class of scale which the plan represents, each title being an electrotype with the figures left blank. Each electro is fitted to a chase so that it may be readily locked into a hand-printing press and printed on the tracing, using considerable ink. This impression is then dusted over with whiting, which both adds to the density of the ink and absorbs the surplus oil so that it dries quickly. The figures are then filled in by hand with a pen. The "plan number" is the date on which the plan was made, followed by the initial of the draftsman, or in case two or more men have the same initial some other letter is assigned. This symbol thus signifies three things; a separate and distinct number for each plan, the date on which the plan was made, and the name of the draftsman who did the work. This system has been in use over twenty years and is well liked by all who use it. A margin of half an inch is allowed on all plans and this title is placed in the lower left-hand corner so that the border line forms two sides of the card. In addition to this, the same plan number is printed in each corner of the sheet *outside* of the border line so that the number may always be readily found, no matter which side up the sheet may be or whether it is so covered up that only one corner is visible.

W. H. SARGENT.

E. AND T. FAIRBANKS AND CO.,
St. Johnsbury, Vt., U. S. A.

R. R. TRACK SCALE

M. S. B.

GAUGE 4 FT. 8½ IN.
PLATFORM 60 FT. X. 7 FT. 6 IN.
PLAN NO. 2-25-'01-S
ORDER [redacted] DRAWER 157

FORM OF TITLE FOR A DRAWING.

Editor American Machinist:

Regarding various features of drawing office practice, the use of full and dotted lines, scales, the arrangement of views, and figures, I would ask the readers who are studying drawing to carefully note, line by line, the instruction given in the accompanying sheet, as it contains that which from my own experience I would fully endorse as a guide sheet. In receiving this sheet a short time ago, I was struck with the clearness of the instruction and how thoroughly practicable it is. It was, no doubt, prepared by a practical man who fully knows the requirements. It could be adopted as a standard.

The scale of drawings, especially for details, should be made to allow the use of a two-foot pocket rule, as very often such a rule is applied to the blueprints.

Of views or projections, making the right-hand end view at the right-hand end is by far the preferable plan.

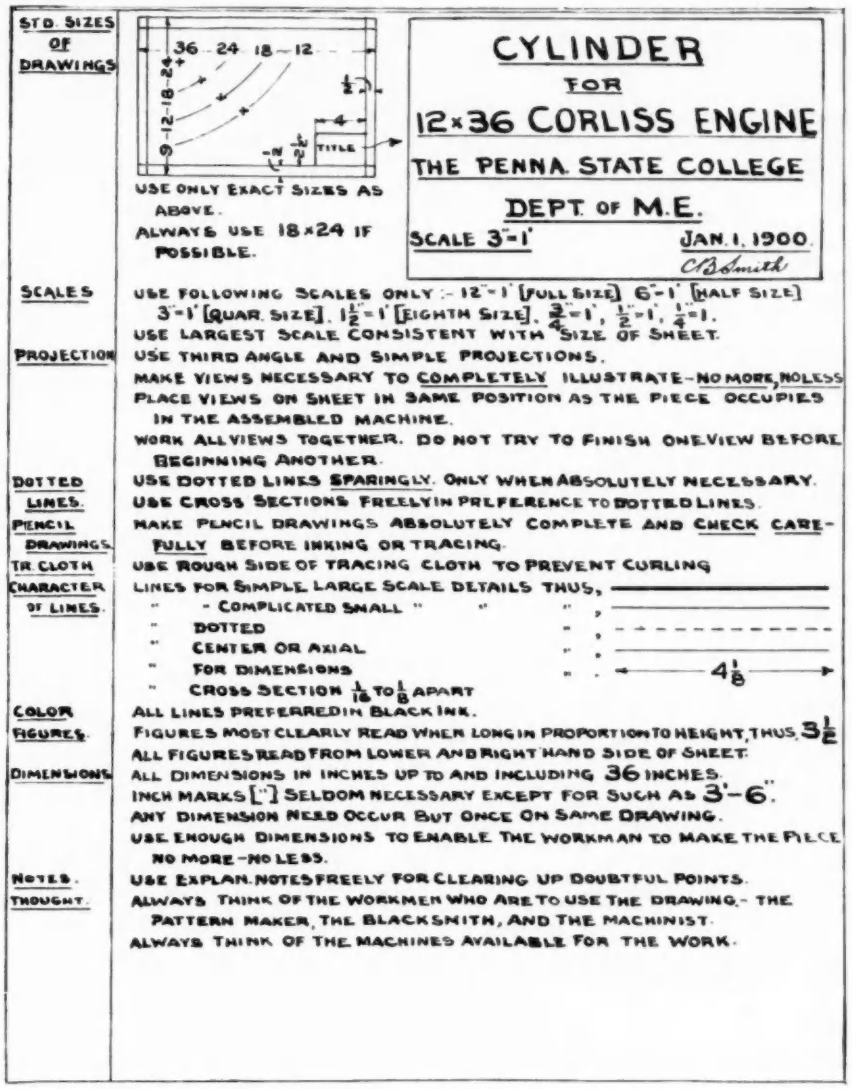
Showing the details of a machine in the position they will occupy on the machine is not as carefully followed out as it might be, but it repays one to do so. I have invariably practiced and insisted on this method. There are, of course, exceptions, but these apply to long vertical shafts, etc., only. The plan aids the shopmen in erecting new machines, and it also helps the new men put on standard machines.

Cross sections and other sections, just cutting open, as it were, an intricate part here and there, will aid the patternmaker in understanding what cannot be so easily accomplished by dotted lines; the views in themselves being the plan, front and end elevation.

Using the fraction dividing line on the angle is not to be preferred to the horizontal line. It has been practically demonstrated that it leads to possible misreading of the fraction, as $1\frac{1}{16}$ for $\frac{11}{16}$, etc. No, its use ought not to be allowed; in fact, very few draftsmen use it to-day. Again, many of our drawings are made without using one or the other. It may appear to many of your readers as going to extremes to find drawings figured in that way, and also omitting the inch marks on all dimensions of whole numbers, or compound fractions of inches up to 24 or 36 inches, but retaining their use for feet and inch dimensions, as 3′—6½″, etc. The drawings look better, are certainly quite as readable, and not any more likely to cause shop errors on this account.

The same dimension appearing on more than one view simply gives room for omitting one of them when making a correction, and, "sure as fate," the one omitted will be seen and worked to in the shop.

Think of the workman in the shop. Try to put yourself in his place. In fact, see your work going through the shop. The


STD. SIZES OF DRAWINGS
36 24 18 12
USE ONLY EXACT SIZES AS ABOVE.
ALWAYS USE 18×24 IF POSSIBLE.
CYLINDER
FOR
12×36 CORLISS ENGINE
THE PENNA. STATE COLLEGE
DEPT. OF M.E.
SCALE 3"=1' JAN. 1, 1900.
C.B. Smith
SCALES
USE FOLLOWING SCALES ONLY:- 12"=1' [FULL SIZE] 6"=1' [HALF SIZE] 3"=1' [QUAR. SIZE]. 1½"=1' [EIGHTH SIZE]. ¾"=1', ½"=1', ¼"=1.
USE LARGEST SCALE CONSISTENT WITH SIZE OF SHEET.
PROJECTION
USE THIRD ANGLE AND SIMPLE PROJECTIONS.
MAKE VIEWS NECESSARY TO COMPLETELY ILLUSTRATE-NO MORE, NO LESS
PLACE VIEWS ON SHEET IN SAME POSITION AS THE PIECE OCCUPIES IN THE ASSEMBLED MACHINE.
WORK ALL VIEWS TOGETHER. DO NOT TRY TO FINISH ONE VIEW BEFORE BEGINNING ANOTHER.
DOTTED LINES.
USE DOTTED LINES SPARINGLY. ONLY WHEN ABSOLUTELY NECESSARY.
USE CROSS SECTIONS FREELY IN PREFERENCE TO DOTTED LINES.
PENCIL DRAWINGS.
MAKE PENCIL DRAWINGS ABSOLUTELY COMPLETE AND CHECK CAREFULLY BEFORE INKING OR TRACING.
TR. CLOTH
USE ROUGH SIDE OF TRACING CLOTH TO PREVENT CURLING
CHARACTER OF LINES.
LINES FOR SIMPLE LARGE SCALE DETAILS THUS,
" - COMPLICATED SMALL " " " ,
" DOTTED " ,
" CENTER OR AXIAL " ,
" FOR DIMENSIONS " . 4 1/8
" CROSS SECTION 1/16 TO 1/8 APART
COLOR
ALL LINES PREFERRED IN BLACK INK.
FIGURES.
FIGURES MOST CLEARLY READ WHEN LONG IN PROPORTION TO HEIGHT, THUS, 3½
ALL FIGURES READ FROM LOWER AND RIGHT HAND SIDE OF SHEET.
DIMENSIONS
ALL DIMENSIONS IN INCHES UP TO AND INCLUDING 36 INCHES.
INCH MARKS ["] SELDOM NECESSARY EXCEPT FOR SUCH AS 3'-6".
ANY DIMENSION NEED OCCUR BUT ONCE ON SAME DRAWING.
USE ENOUGH DIMENSIONS TO ENABLE THE WORKMAN TO MAKE THE PIECE NO MORE-NO LESS.
NOTES.
USE EXPLAN. NOTES FREELY FOR CLEARING UP DOUBTFUL POINTS.
THOUGHT.
ALWAYS THINK OF THE WORKMEN WHO ARE TO USE THE DRAWING,- THE PATTERN MAKER, THE BLACKSMITH, AND THE MACHINIST.
ALWAYS THINK OF THE MACHINES AVAILABLE FOR THE WORK.

DRAWING ROOM PRACTICE AT PENNSYLVANIA STATE COLLEGE.

planer work, especially, needs attention. Space is required for tools to enter and leave the cut, and unless provision is made at both ends of some planing surfaces, the planer hand will have to chip it out.

As to the standard size of drawings. The double elephant 27x40 inches, allowing for waste in trimming, can be cut 26x38½, 19¼x26 and 13x19¼. These are sizes in use at the Niles works, being a little larger than those given in the table of instructions. WM. PILTON.

Editor American Machinist:

In giving us some points in drawing-room practice in your issue No. 8, Mr. L. O. Danse omitted several that have become almost universal practice in our large establishments. In this regard should be mentioned the discontinuance of the colored inks, and the adoption of black ink for all lines, making center and dimension lines quite light and broken. So-called standard section lining is also little seen now, the best draftsmen preferring to use plain section lines and label the piece as to its material. This avoids the confusion arising from many not remembering all the standards of section lines.

It should be the aim of the draftsman to keep details of castings and forgings on separate sheets, both for the convenience of the blacksmith and the pattern-maker. Patterns are usually designated by consecutive numbers, each number being prefixed by an initial letter which identifies the machine upon which the casting is used. Thus a pattern numbered SH172 would be some part of the steam hammer. Forgings are usually designated by letters. The name of the casting or forging is placed upon the drawing as well as the designating letter or number, and both are given in the orders sent the shop foremen for their work.

A shop must have a large number of draftsmen to be able to make a new drawing each time a change is made in the design of some machine. A quick way to make such changes and keep the old records is to make a blueprint of the tracing before the changes have been made, and file this print away in the same manner as if it were a tracing, at the same time making a reference on the tracing to the print for all machines previous to the one on which the change is first made. A place should be provided on each tracing for such reference.

It is the custom in many shops making semi-standard machinery to use a set of duplicate blueprints for sending into the shop details of changes from the standard which may be required for special machines. Two prints are taken of the tracing, the parts not required are blocked out with a blue pencil, any changes wanted are drawn in with caustic potash, and any old dimensions wanted changed are blocked out with the potash, leaving white squares to be filled in with new dimensions. Simple changes are easily made in this manner and often quite extensive changes may be made in a couple of hours that would require a couple of days if they were to be laid out and traced.

Then there is the letter-press copy book and the copying ink pencil, which make a very convenient way of keeping records of all free hand sketches sent to the shop. For hurry-up jobs, machines are often put through the shop in this manner and tracings made afterwards.

It is certainly strange that so few draftsmen understand the dimensioning of drawings, and that fewer still think there is anything to be learned further than to stick on a dimension here and there, the more the better, seeming to be their idea. It is a fact that an otherwise fine drawing is often spoiled by careless dimensioning. There are no definite rules to be given for this important work of the draftsman, but the following should be kept in mind: Keep dimensions outside of the figure wherever possible—and it is possible in most cases. Make the strings of dimensions continuous in a straight line, giving the over-all dimension outside of the others. See that no dimensions given for the use of the blacksmith or patternmaker are dependent upon future operations in the machine shop. Give the offset of slanting pieces by co-ordinate dimensions rather than in degrees. Give diameters—not radii—of circles, and where there are several concentric circles, extend dimension lines to the several circumferences and give the diameter of the largest circle farthest away and of the smallest nearest to the figure. Make neat figures and index points; aim at uniformity and avoid crowding. The draftsman should cultivate the ability to look ahead of the moment, that he may not find he has placed a dimension *just* where some other dimension *must* be placed a little later on.

But this is digressing from the point of standard practice. The plan view of a detail is always placed on top, the side view beneath this, and the end views at the end of the side view, each adjacent to the end it represents. This custom is sometimes departed from in drawing the general arrangements of large machines for convenience in laying out the sheet. It

should never be departed from in detail work, as this is one of the frequent causes of trouble for the drafting room.

Bay City, Mich. C. F. BLAKE.

Proportions of Gears—Patterns for Gear Teeth—Stuffing Boxes.

Editor American Machinist:

The accompanying diagram, Fig. 1, has been used by me for some years, and if followed carefully will produce excellent gears. I do not know whether it is used by others—it may be by many. One firm who make a great many gears must have some very similar system, as their gears that I have seen agree almost exactly with my own. The reference letters in the diagram have the following values:

$F = 2\frac{1}{2}\ P$,
$F_1 = F + f$,
$I = F_1 + 2\ f_1$,
$K = 1\frac{1}{2}\ L + \frac{1}{2}''$,
$K_1 = 1\frac{1}{2}\ L_1 + \frac{1}{2}$,
$K_2 = K_1 + 2''$,
L = bore of pinion,
L_1 = bore of wheel,
$M = 0.6\ P \sqrt[3]{T}$,
$M_1 = 0.7\ M$,
$N = 0.35\ M \left(\text{or } \frac{M_1}{2}\right)$
$N_1 = 0.35\ M_1$ (or $0.7\ N$),
$O = \frac{1}{6}\ P$,
$S = \frac{1}{2}\ P$,
$S_1 = \frac{1}{2}\ P$,
T = number of teeth,
$U = \frac{1}{2}\ P$,
$U_1 = \frac{2}{3}\ P$.

The table gives values for f, f_1, f_2 and H:

PITCH, Inches	½	⅝	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3
f	¼																⅜				
f_1	¼	½	5-16	⅜	7-16	7-16	½	9-16	⅝	⅝	11-16	¾	13-16	13-16	⅞	15-16	1	1	1 1-16	1⅛	1 3-16
f_2	⅛					3-16											¼				
H	2⅛	2 7-16	2⅞	3 5-16	3¾	4⅛	4 9-16	5	5 7-16	5¾	6 3-16	6⅝	7 1-16	7 7-16	8	8 7-16	8⅞	9 3-16	9⅝	10 1-16	10½

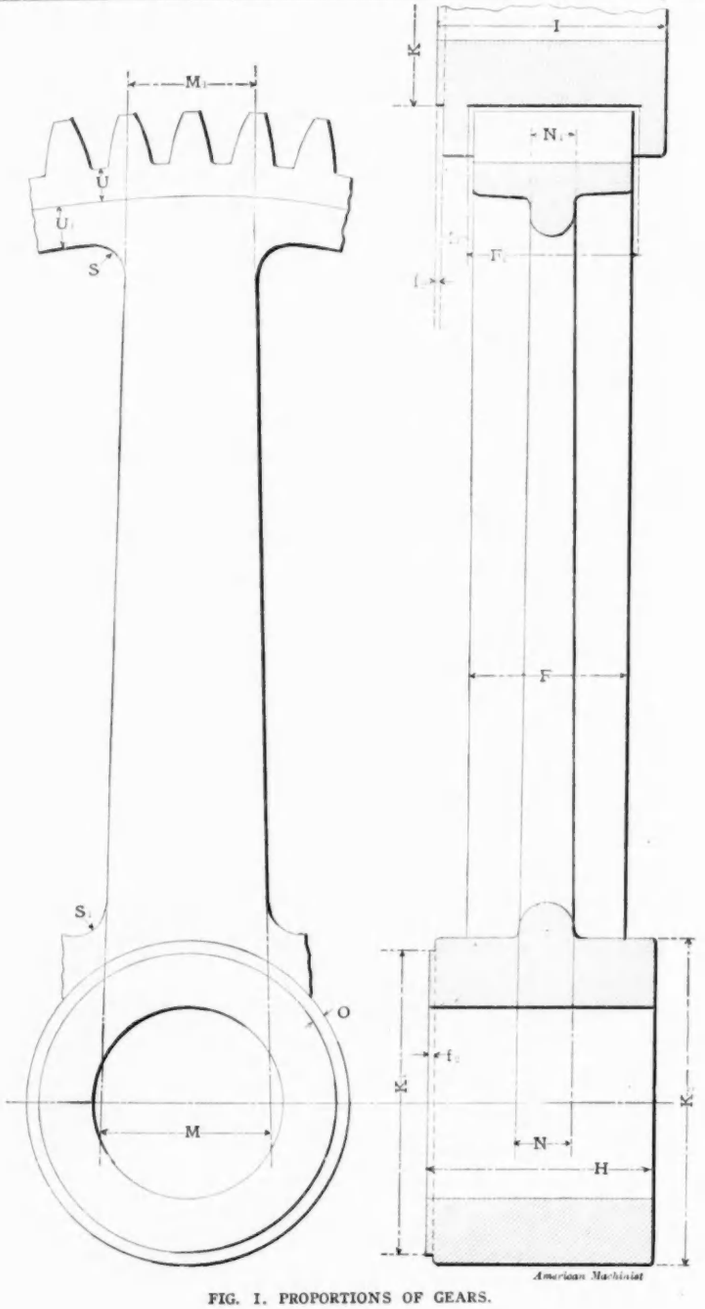


FIG. 1. PROPORTIONS OF GEARS.

One of our patternmakers has a little kink for making the teeth of gears that seems to me to be worth showing, and Fig. 2 is a rough sketch of it. *A* is a block of either hard or soft wood with a notch cut out the length of the tooth *B*; *c c* are thin spurs to prevent the tooth's twisting. The tooth-shaped part is made a trifle tapering—for draft. A common rabbet plane is used for planing the teeth, care being taken not to have the cutter travel much more than the length of tooth.

When the teeth require a reverse curve for the flank a "round" as well as a rabbet plane will have to be used; in which case the stock for fillets cannot be left on, and fillets will need to be put in after the teeth are on the blank.

The parts *D D* should be made parallel and the taper be divided equally so that the teeth can be readily squared when fastening to rim. They are to be cut away after attaching to the rim so as to have a neat fillet.

The same rig is used for bevel gears. The thing to remember is to lay out the gear with teeth as long as the "former" is to be, and if each end of the former is properly laid out the gear tooth will be the correct shape.

There is a little detail in the construction of stuffing boxes that I would like the opinion of your readers on. In almost every case stuffing boxes are made, as in Fig. 3, with beveled top and bottom. If a short bevel is good, why would not a long one be better? The great majority of rod packings now used are square (or at least I suppose they are) and I cannot see the sense of putting a beveled edge to press on a flat packing—seems to me it would cause the packing to "flutter" in the vacant space.

Another question: If ¾-inch packing is right for a 3-inch rod, why isn't it all right for a 6-inch as well? Someone may say: "If ¾ inch is right for a 3-inch rod, why isn't it also right for a ¾-inch or 1-inch rod?" The answer to that is that there is reason in most (if not all)

things, and it would be difficult to bend ¾-inch square packing around a ¾-inch rod. But I never could understand why some builders put, say, ¾-inch on a 3-inch rod and 1 inch on a 4-inch—unless perhaps it's like keyseats, one-fourth the diameter. E. S. NEWTON.

[With the usual form of stuffing box, leakage is apt to take place around the outside of the packing, even though the gland be more than tight enough to stop leakage around the rod. The proper form for the end of the gland is shown in Fig. 4. The bottom of the box should be square.—Ed.]

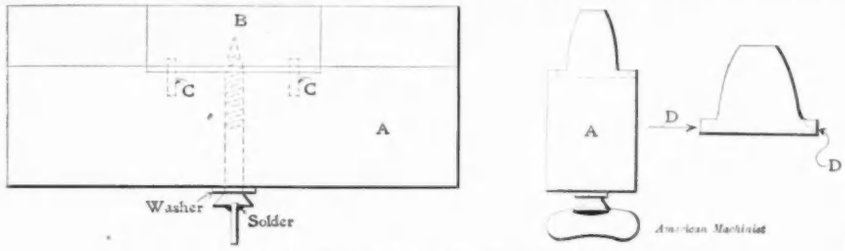


FIG. 2. MAKING GEAR-TOOTH PATTERNS.

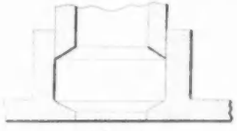


Fig. 3

Fig. 4

STUFFING BOXES.

The Speed of Emery Wheels.

Editor American Machinist:

Your editorial on "The Importance of Speed of Emery Wheels" reminds me that recently we had occasion to test some wheels in our engineering laboratory, and the results obtained with different speeds were very marked.

In conducting the tests, a Reeves variable-speed counter-shaft was used, and speeds were obtained varying from 2,000 to 9,500 feet per minute, circumferential velocity. In all of the wheels tested it was found that each wheel had a speed which was best adapted to produce a maximum of abrasive action with a minimum amount of heat. In one case in which a 10-inch wheel was used, the manufacturer's speed was indicated on the wheel as 2,500 revolutions per minute, corresponding to a circumferential velocity of 6,500 feet per minute. A test of the wheel showed that 1,800 revolutions, or about 4,700 rim speed, gave decidedly better results without heating or glazing, and with no perceptible flouring or wearing away of the wheel.

The question of running a particular grade of wheel at a certain definite speed does not generally receive the importance which it deserves. Manufacturers are usually best qualified to designate what this speed should be, but the results of some of our tests indicate that even they do not always give the careful attention to this matter which it merits. J. J. FLATHER.

Minneapolis.

Making Plug Cocks Tight.

Editor American Machinist:

When Osborne told us in No. 8 about Billy making cocks tight enough to stand 350 pounds pressure, he did not explain the method; so I am wondering whether it is the same as I have introduced in our shops to cure the trouble experienced by many of our customers in keeping our 2-inch racking cocks tight. I learned it while still a boy and I regard it as one of the old things that is too good to drop. The method consists simply in lightly draw-filing the cock so as to relieve the bearing of the shell on the plug, except for about ¼ inch, all around the passage, and then grinding in as usual. This gives a good bearing of the working edges which is not affected by variation of temperature and is not lost until wear has brought it down to the surface of the draw-filed part. L. O. DANSE.

The Water Anneal.

Editor American Machinist:

On page 284 you print a clipping from the "Jewelers' Circular," describing a process for softening steel; and although you seem to be skeptical, the article is in the main all right. It described a kink which I have not used or thought of for years, but which was well known among the old-time gun men, and was the means of saving many hours in the days when guns were built by contract.

The process, as described to me by an old Springfield Armory man, and which I have used successfully many times, is to heat the piece of tool steel to a nice cherry red, letting it soak a while in the fire without the blast, to ensure an even heat; then remove it from the fire, place it on a piece of charcoal and lay it away in a dark place, an empty charcoal barrel being generally handy and just the place for it, with a board on top to keep out the light. Allow to lie until the red is just disappearing, then quickly immerse it in water, holding it perfectly still until cold. If it comes out mottled with white spots it will probably be all right and will have what is known as a water anneal. If the combination is struck right, the steel will be as soft as it can be made with a charcoal pack, and many hours can often be saved. I wonder if this kink is generally known among toolmakers now. TEDDY.

[Our correspondent describes quite well the old and familiar process of "water annealing," his complete method being more promising than as crudely described in the "Jewelers' Circular"; but we think it will generally be conceded that at the best the results secured are very unreliable, and not to be compared with the regular, although much slower, process generally employed.—Ed.]

Right or Left.

Editor American Machinist:

Referring to your criticism of the Austin lathe in No. 8, I would remark that some of our designers hold that with a quick-geared carriage (which necessarily calls for a big hand-wheel) the location of the wheel at the right is the proper caper. For American examples see Sellers *et al.* I believe the arrangement as carried out by Sellers, for example, seldom gives offense to users who have been accustomed to the left-hand arrangement; but can we say the same for the reverse? However, I would not jar our settled or prevailing practice by placing to right, except for export. H. W. P.

The Compound Rest for Setting a Thread Tool.

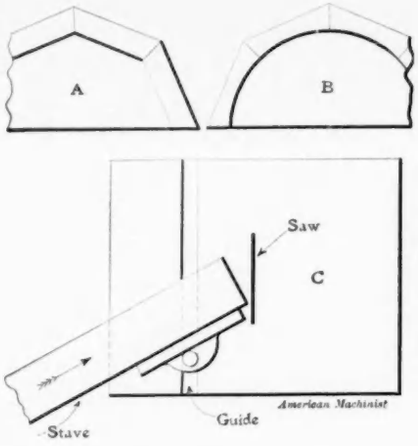
Editor American Machinist:

There is a use for the compound rest that was not mentioned in the articles on the subject that appeared in your issues Nos. 2 and 7, 1901. It is much used in oil-country shops for re-setting internal threading tools. Swing the rest around 90 degrees, or parallel with the travel of the carriage, and after the thread is roughed out and the finishing tool is set, throw in the lead-screw nut, and it is an easy matter to bring the tool to the thread by manipulating the screw of the compound rest. G. T.

The Better Way to Make a Drum Pattern.

Editor American Machinist:

The usual practice in the making of patterns for drums, etc., is as in sketch *A*. Another way that I have seen is like *B*, with the heads sawed on the band-saw right to the line, and the staves sawed out on the circular saw to suit. This is done by setting the stave at the correct angle (by trying) and adjusting the saw to the right hight, like sketch *C*. The patternmaker who reads this, and who has never used this way, will probably



TWO WAYS OF MAKING A DRUM PATTERN.

say the same thing I did, and that is, that it is a slower method; but just let him try this other way, and see.

PHOS PHORUS.

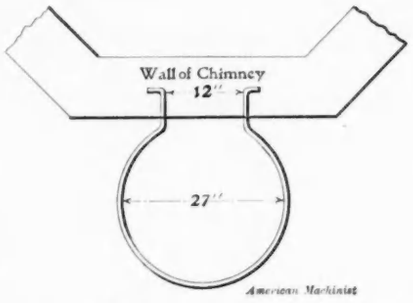
Soda Water.

The removal of the Boyer Machine Company to Detroit and the building of the new shop was quite an event in that city, and the citizens showed much interest by personal visits during its erection. On one occasion a benevolent-looking old gentleman, in faultless attire and gold-rimmed eye-glasses, was looking around and ran across our good friend S. E. Freeman, of St. Louis, who, at the time, was looking after the laying of the oil and soda-water supply pipes in the pipe conduit, shown in our issue No. 10, 1901. The old gentleman was much interested in the blueprints and their uses, and in looking them over he ran across those relating to the conduit and pipes. The memorandum calling for the soda-water pipe struck his eye, and, adjusting his eye-glasses to make sure he had made no mistake, he asked in surprise, "Does Mr. Boyer supply soda water to his men?" Freeman, who enjoys a joke as well as anyone, "caught on" at once and replied, "Oh, yes! Some of these men have to work very hard, and in hot weather they need plenty to drink. Mr. Boyer is laying this soda-water pipe with branches convenient for every man." The visitor was very much impressed with the arrangement, but asked if the men were all satisfied with the same flavor. "Oh, no," replied Freeman, "we send the syrup and icecream around on trucks." Needless to say, the old gentleman left the place with a very exalted impression of Mr. Boyer's kindness and thoughtfulness as an employer.

A Chimney Ladder, "Made in Germany."

Wm. B. Coggswell, vice-president and chief engineer of the Solvay Process Company, of Syracuse, N. Y., relates that while traveling through Germany a short time since he caught a glimpse from a car window of a brick smokestack that was being erected and saw upon it a ladder of new design, the advantages of which immediately impressed him very strongly with the result that a new smokestack which has since been built in his own establishment in Syracuse has this ladder applied to it.

The rungs of this ladder are made as shown by the accompanying sketch made by Mr. Coggswell. The idea is that a man climbing to the top of this stack gets inside of these rungs, where he is much more secure than upon the ordinary ladder, as he cannot be blown off and feels much more safe than when he is outside, besides which he can at any time rest



A CHIMNEY LADDER "MADE IN GERMANY."

himself completely by standing with both feet and his elbows upon the rungs of the ladder at the same time, or he can put his arms over the rungs at any time, or if he likes can have a piece of plank 30 inches long with him, which he can can put across one of the rungs and stand upon, thus making himself perfectly secure while working.

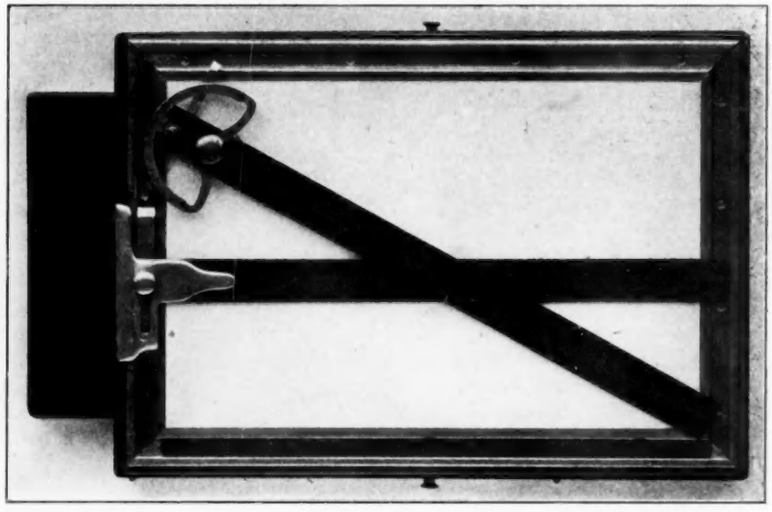
It is Mr. Coggswell's belief, and we agree with him, that all chimney ladders should be made in this way.

Some New Things.

A HANDY DRAWING OUTFIT.

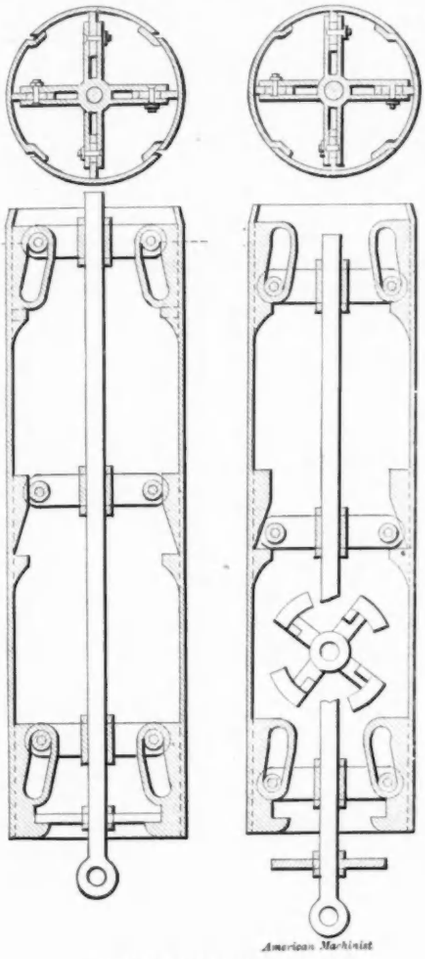
The half-tone shows not merely an improved drawing board, but what is in fact as well as in name a complete and handy drawing outfit, except the compasses for circular work. It is specially adapted to facilitate the making of accurate sketches, or for small mechanical drawings of any kind. There is first a well-made mahogany box with a drawer for the T-square used, and into which may be placed compasses, pencils, pens or other small articles in sufficient quantity for the work. The drawer is narrower than the box, but the end of the drawer forms when closed the entire end of the box, fitting snugly to the sides with a miter joint at each corner. When the drawer is pulled out, a thin board can also be withdrawn and upon this is placed the sheet of drawing paper, the ends and sides merely lapping over the board, and when the board is replaced and the drawer is closed the board and paper are held snugly by the pressure of springs beneath. With the paper in position, the upper surface of the board or box has a border of German silver all around it about 1¼ inches wide, and upon one side and end there is a lip turned up which serves as a guide for a long V-groove in the head of the T-square. The blade of the square is graduated, and on the sides of the board are also graduated strips. These latter can be slid along in either direction, so that there is no arbitrary and fixed starting point for any of the measures. In addition to this there is an adjustable gage or pointer on the head of the square which may be adjusted to bring the blade at any desired point of departure to coincide with the graduations of the scales attached to the board.

Besides the T-square with fixed head a second square is provided with a graduated protractor head, which may be used



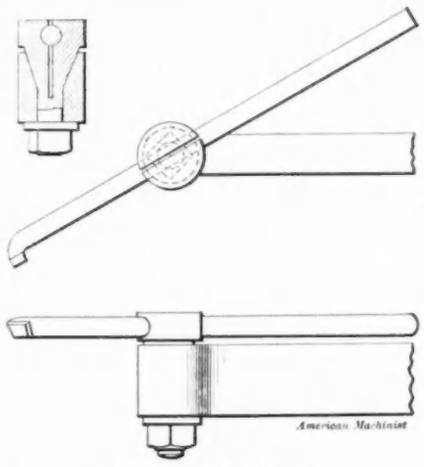
HANDY DRAWING OUTFIT.

for angular work. The entire arrangement is of a character to be more fully appreciated after actual inspection than from any description. The apparatus is now made in two sizes: for sheets 10x15 inches and 15x20 inches. The makers are J. & G. Rich, 120 N. Sixth street, Philadelphia, Mr. Rich having made the first of these for his own use at his desk.



A COLLAPSING CORE BAR.

A familiar and constant problem of the molder in casting pipes or hollow cylinders of any except very small sizes is to provide means for allowing the core to collapse or yield under the pressure of the shrinking metal as it cools. If provision is not made for this contraction of the casting, it splits and is useless. The winding of the bar or skeleton with some combustible material before the external loam is applied is a tedious and costly operation, and the generation of gases by the burning of the core wrapping is a highly objectionable feature. Various attempts have been made at the production of mechanically collapsing core bars, and an interesting number of the family is shown in the accompanying cut from a recent patent. The exterior of the bar consists of four staves, the edges of two of which lap over the depressed edges of the other two as shown, and slide thereon in the act of expanding or collapsing. The left-hand figure shows the core bar expanded and the right-hand figure shows it collapsed or contracted, the change in condition being effected by the central longitudinal draw-bar. When this bar is thrust upward, the staves are distended and then by turning the bar the four arms of the spider at the lower end of the bar engage with lugs on the staves, and the bar is locked and it is ready to receive its coating of loam. The surfaces of the staves may be roughed or ribbed, or they may be provided with holes for holding the loam. After pouring, the draw-bar is turned to unlock it and pulled endwise and the staves are thus sufficiently withdrawn to avoid the shrinkage strain. The locking spider is shown in plan inside the right-hand figure. The patentee of this bar is George H. Adam, Home City, Ohio.

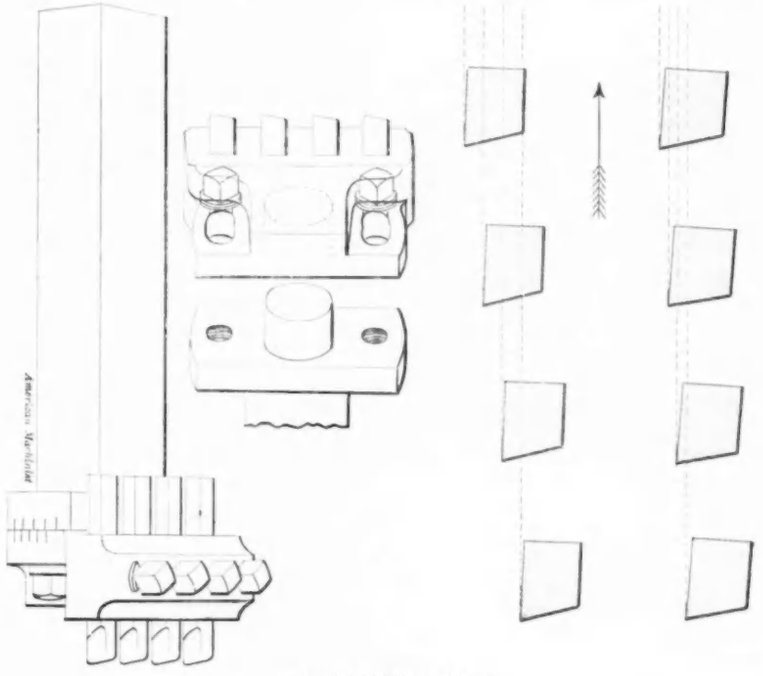


A BORING TOOL HOLDER.

The cut shows a neat and serviceable boring tool holder recently patented. It enables the boring tool to be set to the length required for the depth to be bored, and the tool may also be inclined and turned to the most suitable angle and position. It is of course intended for the better class of small work, especially in the toolroom. The boring tool would naturally be made of Crescent or Stubb's or other round steel rod, accurately fitting the cross-hole in the head of the taper plug, and as this plug is split to a considerable depth, the tightening of the nut fastens the plug in the shank and also securely binds the tool. Different plugs may of course be provided for different sizes of steel. The patentee is Charles Pease, Lynn, Mass.

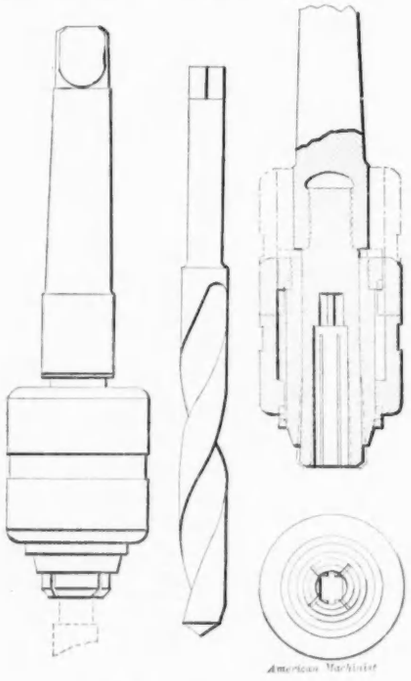
A GANG PLANER TOOL.

The tool here shown has been devised for the more rapid planing of large flat surfaces, such for instance as occur on the bed-plates and other large castings for heavy machinery. It consists of a number of tools which all cut at once, each successive tool being laterally a little in advance of the preceding one, so that with a given number of tools, as, say, four, each stroke of the planer then accomplishes the same result as with a single tool would be done in four strokes. Tools of this design are made with four, five or six cutting tools, and the surface that can be cut is determined, not by the tool, but by the power of the planer drive and the firmness with which the work is secured to the platen. The cutting tools are all made precisely alike, and, being ground to a gage provided, they are interchangeable. With the holder in place in the machine the lower faces are all accurately adjusted to the horizontal plane by merely letting them rest upon the platen, or any surface parallel with it, before tightening the set-screws. The



A GANG PLANER TOOL.

tool holder is swiveled and finely graduated, so that different rates of feed may be used, and the work may be always equitably divided between the several tools. This turning of the tools of course changes the side clearance somewhat, but so slightly as to be inappreciable. This is shown diagramatically at *A* and *B*, the former showing double the feed of the latter, the greater clearance occurring with the finer feed. This tool is made by the Armstrong Brothers Tool Company, West Washington and Desplaines streets, Chicago.



A QUICK-ACTING DRILL CHUCK.

The chuck here shown, recently patented, is for holding small, quick-running drills, bits, reamers, etc., so that they can be quickly and easily inserted, taken out or changed without stopping the spindle. The body of the chuck has a taper shank fitting the spindle and an enlarged portion outside. This enlarged portion is bored and cut with a straight thread, into which is screwed the end of the socket which receives the drill. The shanks of all the drills used with this socket are straight and of the same size, and squared or flatted on the end. The socket has a straight hole into which the drill shank slips easily, and the bottom of the hole is squared, with also two opposite slits, for driving either the square or the flat ends of the drills. The exterior of the socket is normally straight or parallel, but is enlarged with a slow taper at the end. This socket has four long slits on the sides dividing the drill-clasping portion into fingers. Outside this socket, and moving freely on the straight part of it, is a sleeve which is parallel both inside and out. As the sleeve is forced down over the enlarged portion of the socket, the hole is slightly contracted and the drill is grasped securely. This sleeve has at its lower end a lip which forms a square shoulder on the outside of it, and a ring screwed on to the upper end of the sleeve forms a similar square shoulder at that end of it. Outside this sleeve is a heavy sleeve with an internal square-shouldered collar much shorter than the space between the shoulders of the inner sleeve, and this heavy external sleeve is used as a hammer to drive the inner sleeve either down or up, and thus tighten or loosen the drill. This chuck is patented by F. J. Freese, Montreal, Canada.

Referring to the articles we have published on the Ferrofix process for brazing cast iron (pages 258 and 280, this year) we may add that we have since seen some of this preparation and also samples of the work done with it. The patent for Belgium and the option on that in the United States is owned by Geo. W. Sillcox, 116 Broad street, New York, who has on hand some of the materials for experimental purposes. Siemens & Halske and the Allgemeine Elektricitaets-Gesellschaft, of Berlin, have fitted up special shops for repairs with Ferrofix, not only for ordinary parts of cast iron, but for soldering cast iron on to copper, bronze, etc., for repairing damaged parts of models, for repairing any pieces coming out of the foundry with some parts damaged, or brazing red copper sleeves, connections to cast-iron pipes and numerous other things.

Personal.

Mr. Earnest Lees, for some years past with the Ingersoll Milling Machine Company at Rockford, Ill., has gone to the Giant Tool Company, Franklin, Pa., as chief draftsman.

It is probably not generally known, but we have recently learned that neither Mr. Brainard nor Mr. Becker has now any interest in the Becker-Brainard Milling Machine Company. It is owned by a Mr. Foss, who is a son-in-law of the late B. F. Sturtevant.

Alexander Cross.

Alexander Cross, for many years superintendent for the Jenckes Machine Company, Sherbrooke, Quebec, Canada, and more recently their business representative in British Columbia, died March 21 of diabetes.

Mr. Cross was a Scotsman by birth, and learned his trade in the works of John Elder. Later he sailed the seas as a marine engineer for several years, but the roving life of a sailor not suiting his tastes he settled permanently in Canada. His mechanical experience ranged from marine engine to sewing-machine construction, with much between, and he was in all this varied field a most accomplished mechanic. He was, moreover, what is much more than this, a most genial, loyal and helpful friend, respected, admired and loved by all.

No apprentice boy could show any signs of earnestness of purpose or of taste for his vocation without attracting his attention. To such boys he was a father and a center of inspiration, and in their behalf he was tireless in enlarging upon the beauties of mechanics, in answering inquiries and in stimulating interest. Helpfulness of this kind was in fact his chief delight. His wide knowledge and experience, his keenly analytical mind and delight in the intellectual side of machine construction, made him a local authority, and his spirit of good will to all drew about him all whose aspirations were of a similar kind. His home was a center for evening gatherings, where many a boy has taken his first lessons in mechanical principles. He should, by rights, have been an instructor in a school shop. The light which he carried was not large, but it was very bright. Although burdened with poor health, he was to the last as enthusiastic a student as a young man in his prime. Was an evening school established he joined it, partly because he expected to find something of interest, but more to induce others to do the same. While not in an obtrusive sense a pious man, he was a consistent church member, and in uprightness of life, in kindly helpfulness to others and in patient self-sacrifice to personal duty, he was an honor to any church.

Situated near the border and a railroad center of travel to and from "The States" as Sherbrooke is, the Jenckes works have always been to a considerable extent a training ground for mechanics who eventually emigrated to this country, and especially to New England. These lines will be seen by many such who will read them with moistened eyes and with the feeling that they have lost one of their best friends in the death of "Sandy" Cross. The world is poorer for his going.

His going to British Columbia was decided upon in the hope of benefit to his health. We do not know his exact age, but judge it to have been in the neighborhood of fifty-five. He leaves a wife, a son, a daughter, and many friends.

Inquiry for Machinery.

(149) Wanted, addresses of the United States Counting Machine Company, and the American Counting Machine Company who make total adders for printing presses, etc.

A Fatal Wood Planer Accident.

On March 19 a workman was instantly killed by a cutter from a wood planer in a cooperage in this city. The man was not employed at the planer, but as he was passing the cutter struck him and entered his heart. The bolt which held the cutter, or a piece of it, struck another man in the face, inflicting a serious wound.